

Center for Astrophysical Sciences

Bloomberg Center for Physics and Astronomy
3400 N. Charles Street
Baltimore MD 21218-2695
FAX 410-516-8260

Title: A Proposal to Investigate Outstanding Problems in Astronomy

Period Covered: December 1, 2003 to November 30, 2004
P.I.: Holland Ford, Johns Hopkins University

Holland Ford and Garth Illingworth organized, managed, and coordinated a very successful year of work by the ACS science team. The team is working well together on analysis of ACS observations and supporting data from other satellites and from ground-based observations. Many important papers have been published or submitted, spanning science from observations of newly discovered debris disks around young stars, to the characterization of galaxy clusters at half the age of the Universe, to observations of proto-clusters with ages of ~ 2 billion years, to searches for galaxies forming within the first billion years after the birth of the universe. One important milestone during the year was the annual team meeting during September. The meeting, organized and led by Holland and Garth, produced a plan for analysis of ACS observations during the coming year, and a plan for obtaining supporting observations with large ground-based telescopes.

Personnel:

During 2004, two new personnel joined the team. Dr. Simona Mei arrived in mid-June to study the elliptical and S0 galaxies in clusters at $z \sim 1$. The goal of her work is to use the galaxies' dispersion in color to estimate their ages. Dr. Ricardo Demarco began working on ACS results in the area of in January 2004. Several personnel worked for the team at JHU in a visiting capacity. Graduate student Michele Cantiello from Italy worked under John Blakeslee's supervision on estimating the distances to galaxies from surface brightness fluctuations, Veronica Motta, visiting from Pontificia Universidad Catolica (PUC) Chile, worked intensely from April through August on reducing spectroscopic observations of galaxies in clusters at $z \sim 1$; visiting graduate student Roderik Overzier spent another year studying ACS images of proto-clusters with redshifts from 3 to 5. We are currently hosting an undergraduate from PUC who is studying the clustering properties of galaxies as a function of their morphology from the ACS GTO fields and will present his Bachelor's thesis in January 2005 at PUC. During the summer, JHU graduate student Soyoung Kim worked with Nicole Homeier to study the resolved stellar population in NGC 1569. We have increased our computing support team by one part-time computer assistant.

We anticipate that several scientists may leave the team for other positions in 2005. We anticipate hiring one more postdoctoral fellow to begin in 2005.

Dr. Benitez left the project in August 2004 to take a full-time, tenured position in Spain.

Programming and Software Development:

ACS Data Archive, Processing and Software Development Group

The ACS pipeline and archive group is responsible for the acquisition, processing, quality assurance review and final ingest of the ACS/GTO science team data as well as team requested public datasets available in the Space Telescope archive. The group also continues to further develop Apsis, the ACS/GTO team's data processing pipeline, the ADC gui, the graphical user interface which allows data grouping from the Science Data Archive (SDA) and controls Apsis processing jobs and Grouper, the ACS team's module which logically groups data for presentation to Apsis. We also continue to enhance features of the SDA and the associated web interface

The pipeline/archive group consists of T. Allen (archive developer), K. Anderson (Apsis developer/manager), D. Magee (programmer), J. Blakeslee (scientist/programmer), N. Benitez (scientist/programmer), G. Meurer (scientist), R. Bouwens, N. Cross (scientist), and F. Menanteau (scientist).

Pipeline Systems (Apsis, Grouper, ADCgui) Development Milestones

- In the past year the pipeline group has accomplished the following:
- 7 releases of APSIS where the current production version now stands at 3.1.5 (October, 2004). A major revision of Apsis came with version 3.0 of this package. A summary of release dates:

apsis-3.0	Nov 20	2003
apsis-3.1	Mar 17	2004
apsis-3.1.1	Mar 18	2004
apsis-3.1.2	May 11	2004
apsis-3.1.3	Jun 30	2004
apsis-3.1.4	Jul 7	2004
apsis-3.1.5	Oct 20	2004

- 13 separate enhancement requests and bug reports were addressed. Some of the major issues addressed include:
 - linearly interpolated aperture corrections for magnitudes delivered to BPZ.
 - on-the-fly astrometric corrections to WCS coordinates based on the HST GSCII.
 - user-selectable catalog parameter sets for sparse field or rich field images.
- Further pipeline work, though not formally defined as an issue yet, has been accommodation of extra-ACS (non-Apsis produced) images which may be desired to be catalogued and subsequently archived. The test images for this work have been the HST-produced UDF WFC. The work has been partially successful to date, though because of the size of the input images (~440MB each), memory issues are preventing a completely satisfactory run. And then only because of a memory crash when trying to create the pipeline's RMS images. All other pipeline functions work well and catalogues have been produced, but without "real" RMS images.

- Enhancements to Grouper which now groups and names all parallel data in the SDA correctly. This has allowed the processing of the UDF WFC and HRC public parallel datasets.
- Continued enhancements to the ADCgui, the graphical user interface for easy user control of Grouper and Apsis processing jobs.
- Adjusted and updated the behavior of ASAP in order to ingest SBC and STIS/FUV-MAMA data into the SDA. These data types had been encountered before this cycle. Adjustments to Apsis also allowed the processing of ACS/SBC data of Ganymede which is now in the archive.
- Efforts to process non-Apsis filter images, namely the public UDF images in 4 bands, were undertaken with some success and catalogs were produced. This was done in an effort to prototype the work needed for processing and archiving images of a more general nature.
- Full documentation of APSIS including a general description, module-level documents, an installation guide and a setup document. These are published under "Documentation" at <http://acs.pha.jhu.edu/science/pipeline/development/>

Science Archive (Archive, Database, User Interface, ASAP) Milestones:

The Science Data Archive (SDA) is a system for storing, retrieving, and analyzing ACS data products generated by the STScI (CALACS), ECF (grism) and GTO (APSYS) data pipelines. Stored data products include calibrated images from CALACS, drizzle-combined images from APSIS, extracted grism spectra, output catalogs from SExtractor and BPZ, and detailed documentation about the manner in which the data were processed. The SDA allows the user to retrieve image files, perform parametric searches of header keywords and output catalog fields, graphically represent the data with line plots and histograms, and extract user-defined "postage stamp" images of individual objects within an imaged field. The SDA returns tabular and graphical results in a number of useful formats, including ASCII, CSV, TSV, HTML, XML, VOTable, JPEG, PNG, and PDF.

- In the past year the archive group has accomplished the following:
- Released several new versions of the ACS Science Data Archive (SDA) user interface:

-v1.11	February	2004
-v1.12	May	2004
-v1.13	June	2004
-v1.14	July	2004
-v1.15	September	2004
-v1.15.1	October	2004
- Published release notes and user guide for all major releases of the user interface.
- Demonstrated the user interface for team members at the September, 2004, ACS Science Team meeting in Aspen and attendees at the October, 2004, ADASS XIV conference in Pasadena, Ca.
- Achieved full compatibility with browsers operating on the Mac OS X platform.
- Added VO (Virtual Observatory) compatible download types to the query output page of the user interface.
- Added the option to download raw APSIS catalogs directly from the user interface.

- Added adjustable scale and stretch options to the clickable object map of the user interface.
- Added the capability to download query results directly using a URL, making the SDA suitable for use as a separate data source in external programs written by team members.
- Drafted a detailed backup and recovery plan for the SDA's database and applications.
- Added support for the ingestion of SBC/STIS data into the SDA.
- Adapted retrieval and ingest programs to continue the support of processing ACS data from STScI and the GTO science data pipeline.
- Initial investigation of PostgreSQL database as a replacement for current Sybase system.

JHU Travel:

- Invited Talk, Advanced School on Extrasolar Planets and Brown Dwarfs (December 2004, Santiago, Chile)
- AAS Meeting (January 2004, Atlanta, GA)
- Gemini Science Meeting, (May, 2004, Vancouver, BC)
- AAS Meeting (June 2004, Denver, CO)
- Goto - Thesis talks in Tokyo and Taipei
- Goto - Thesis presentation at AAS mtg
- Invited Seminar, (Penn State University, College Station, PA)
- Invited Talks, Penetrating Bars through Masks of Cosmic Dust - The Hubble Tuning Fork strikes a New Note, (July 2004, Pilanesburg, South Africa)
- Second TPF Darwin Conference (July 2004, San Diego, CA)
- Invited Talk, Symposium in honor of Prof. Donald Osterbrock's 80th birthday, (July 2004, University of Santa Cruz, Santa Cruz, CA)
- Observing at VLA, APO, Las Campanas, and Magellan
- Collaborative trips: Ford to visit Bartko in CO, Frye to visit Motta at JHU, Rosati to visit Demarco, Motta to visit Frye, Benitez to visit Broadhurst
- IAU Symposium 225, Impact of Gravitational Lensing on Cosmology (19-23 July 2004, Lausanne, Switzerland)
- Starbursts from 30 Doradus to Lyman Break Galaxies (September 2004, Cambridge, UK)
- Astronomical Society of Japan meeting (September 2004)
- ACS Science Retreat Meeting (27 September – October 1, 2004, Aspen, CO)
- ADASS XIV, (October 2004, Pasadena, CA)
- Invited Seminars, Rochester Inst. Tech (Rochester, NY)

Accomplishments and on-going work of paid project personnel

SCIENTISTS

**David Ardila, Ph.D., Astronomer
(100% FTE)**

Observing Runs/Proposals

- Participated in the design for Phase II HST Cycle 13 proposal "Resolved Observations of Circumstellar Disks around Herbig Ae/Be stars"

- Participated in the design for Phase II HST Cycle 13 proposal “Coronagraphic search for disks around nearby stars”
- Selection of Targets for Cycle 14 GTO proposal

Proposals/Observing

- Gemini South/North: “Resolved Observations of Circumstellar Disks around Herbig Ae/Be stars”
- Keck: “The Lambda Bootis Phenomenon”
- Astro-E2: “Establishing the X-Ray Production Mechanism in Young, Solar-Type Stars”

Papers/Talks/Posters

- July 2004, Rice University, invited talk: “Debris Disks and Planet Formation”
- October 2004: IPAC, invited talk: “Resolved Coronagraphic Observations of Debris Disks”
- July 2004, 2nd TPF Darwin Conference, poster: “Dynamical Simulation of the Debris Disk around HD141569”
- Ardila, D.R. et al., “A Dynamical Simulation of the Debris Disk around HD141569,” ApJ, in press
- Ardila, D.R. et al., “A Resolved Debris Disk around the G2V star HD 107146,” ApJL, in press
- Ardila, D.R., 2004, “The Hidden Members of Planetary Systems,” Scientific American, April Issue

Narciso Benitez, Ph.D., Astronomer
(100% FTE, 12-1-2003 through 08-15-2004)

Software Development/Operations

- Member of the pipeline team
- Supervised the work of graduate student Dan Coe, who is developing a specialized software for faint galaxy photometry.
- Developed a new version of the photometric redshift software BPZ. This version is significantly more robust and produces a more comprehensive output. It is being tested for his inclusion in the ACS GTO pipeline.
- Awarded HST proposal for NICMOS imaging of A1689

Data Analysis

- January 24-29, 2004, Israel: Meeting with ACS team member Tom Broadhurst at Tel Aviv Univ. to work on ACS paper entitled, “Strong Lensing Analysis of A1689 from Deep Advanced Camera Images”

Observing

- January 31-February 7, 2004, Granada, Spain: Planning complementary ACS ground-based observations with Granada

Papers/Talks/Posters

- February 2, 2004, Granada, Spain (Astrophysics Inst. of Andalucia): Talk on pipeline

**John Blakeslee, Ph.D., Astronomer
(90% FTE)**

Operations/Software Development:

- Implemented automatic astrometric calibration of the processed images in Apsis. Added various command-line options to Apsis to provide user control of output image size and absolute shifts, and for manual adjustment of object detection threshold in the alignment stage.
- Improved estimation and removal of residual amplifier boundaries.
- Prepared, with D. Kelson, the Cycle 13 phase 2 proposal for the intermediate-redshift cluster program imaging of the outskirts of CL0152.

Data Analysis

- Analysis of the color-magnitude relations in the clusters MS1054 and CL0152 at $z = 0.83$ (paper in preparation).
- Supervised thesis research by M. Cantiello (visiting from U. Salerno for six months) on archival ACS/WFC data.

Papers/Posters/Talks/Panels

- Blakeslee, et al. 2004, "Advanced Camera for Surveys Observations of a Strongly Lensed Arc in a Field Elliptical," ApJ, 602, L9.
- Blakeslee, Ford, Postman, et al. 2004, "ACS Observations of Galaxy Clusters in the Young Universe," in Hubble 2004: Science Year in Review, in press.
- June 2004, AAS Meeting: "Update on the ACS Intermediate Redshift Cluster Survey"
- Blakeslee and Ford, 2004, "A Day in the Lives of Galaxies," STScI Press Release 2004-21, July 2004.
- Blakeslee, Postman, Miley and Rosati, 2004, "Images from Hubble's ACS Tell a Tale of Two Record-Breaking Galaxy Clusters," STScI Press Release 2004-01, January 2004.

**Nicholas Cross, Ph.D., Astronomer
(100% FTE)**

Pipeline Operations

- Quality Assurance (with Felipe) of APSIS products.

Papers

- Cross et al. 2004, "The Luminosity Function of Early-Type Field Galaxies at $z \sim 0.75$," AJ, 128, 1990.
- with Roderik Overzier on "A Comparison of the Morphologies of $z=4.1$ Lyman Break Galaxies in a protocluster and the field." For this work I am analysing the morphologies of LBGs in TN1338-1942, the UDF parallels and GOODS using code that I wrote to measure the morphological parameters in Lotz, Primack & Madau (2004).
- made contributions to the Goto et al. (2004) cluster luminosity function paper
- made contributions to the Postman et al. (2004) morphology density relation paper.

Observing Runs

- P.I. on VLA Proposal from June 2004 accepted with R. White, T. Goto and R. Demarco.: 18.5hrs of VLA L-band time targeting CL0152-1357 (with a small amount of time on CL0848+4452). These data were observed 17/18 Oct 2004 and 21/22 Oct 2004.

- Co-I on UKIRT Proposal with T. Goto, N. Homeier and M. Postman accepted: 1 night to observe CL0910+5422 in J and K using WFCAM. Unfortunately there are problems with the instrument so we have to resubmit.

Ricardo Demarco, Ph.D., Astronomer
(90% FTE, 01-01-04 to present)

Software Development

- Improvement of own dedicated software to reduce VLT/FORS multi-object spectroscopic data of two galaxy clusters in the ACS GTO program.

Data Analysis

- Reduction and analysis of VLT/FORS spectroscopic data of galaxy clusters RXJ0152 and RDCS1252 (ACS GTO clusters). Spectra available for 102 spectroscopic cluster members in RXJ0152 ($z=0.837$) and 38 spectroscopic cluster members in RDCS1252 ($z=1.237$).
- Integrating ground-based (VLT) spectroscopic information on RXJ0152 and RDCS1252 with ACS data in a single master catalog for each cluster.
- Joint analysis of ground-based (VLT) spectroscopic data, ACS data and X-ray data for the galaxy clusters RXJ0152 and RDCS1252. This work is fundamental to study the spectrophotometric properties of spectroscopic cluster members in order to understand galaxy evolution in clusters, and to characterize the dynamical state of the clusters.

Papers/Talks/Abstracts

- Demarco et al. 2004. "A VLT Spectroscopic Survey of RX J0152.7-1357, A Forming Cluster of Galaxies at $z=0.837$," A&A, submitted.
- Demarco et al. "Spectrophotometric properties of star-forming galaxies in the red sequence of RXJ0152 ($z=0.837$)" (paper in preparation)
- Demarco et al. "A VLT Spectroscopic Survey of RDCS1252" (paper in preparation).
- Demarco et al. "Panchromatic Studies of Distant Clusters of Galaxies," Modern Physics Letters A (invited review, paper in preparation).
- February 3, 2004, Northwestern University, Chicago, IL: "Panchromatic Studies of Distant Clusters of Galaxies" (talk)

David Golimowski, Ph.D., Astronomer
(75% FTE 12-01-03 to present)

Operations

- Served as data marshall for GTO and related science programs. Activities included retrieval of calibrated data products from MAST and ingestion into Science Data Archive (SDA), ingestion of APSIS data products into SDA, monitoring MAST for updated calibration reference files, and alerting science and pipeline teams of newly acquired, updated, or APSIS-processed data.
- Served as advisor to SDA development team.

Observing Programs

- Very Large Telescope Observatory, Programme 074.C-0407, "The Binary Brown Dwarf LHS 102BC: Orbits and Masses," 3 hours observing time

Papers/Posters/Talks

- Golimowski et al. 2004, "The Solar Neighborhood. IX. Hubble Space Telescope Detections of Companions to Five M and L Dwarfs within 10 pc of the Sun," AJ, 128, 1733
- January 2004, AAS Meeting, Atlanta, GA: "Discoveries of Faint Companions to Nearby Stars with HST" (talk)

Tomotsugu Goto, Ph.D., Astronomer
(100% FTE 12-1-03 to present)

Data Analysis

- Computed photometric redshift for galaxies in CL1252 cluster fields by psf matching the ACS i,z data to the ground-based BVRJK data.

Observing Runs/Observing Proposals

- Wrote a successful proposal to UKIRT telescope to obtain near-infrared data of CL0910. Observation cancelled due to the instrument failure.

Papers/Talks/Posters

- Goto et al. 2004, "The Luminosity Functions of the Galaxy Cluster MS1054-0321 at $z=0.83$ Based on ACS Photometry," submitted to ApJ.
- Goto et al. "Velocity Dispersions of 6 Galaxy Clusters at $0.83 < z < 1.27$: Is the Ram-pressure Stripping Responsible for Cluster Galaxy Evolution?" (paper in preparation)
- Goto et al. "Luminosity Functions of Red-sequence Galaxies in 6 $z \sim 1$ Clusters" (paper in preparation)
- September 2004, Astronomical Society of Japan, University of Tokyo, and the National Astronomical Observatory of Japan: "Velocity Dispersions of 6 galaxy clusters at $0.83 < z < 1.27$: Is the Ram-pressure Stripping Responsible for Cluster Galaxy Evolution?" (talk)
- Goto, T. and HST/ACS Team, "Velocity Dispersions of Six Galaxy Clusters at $0.83 < z < 1.24$: Is Ram-Pressure Stripping Responsible for Cluster Galaxy Evolution?" AAS, 205, 161.03.

Nicole Homeier, Ph.D., Astronomer
(100% FTE, 12-1-03 to present)

Observing runs and programs

- PI, Gemini North NOAO proposal: "The Luminosity-Metallicity Relation for Cluster Galaxies at $z \sim 0.8$ "
- PI, ESO VLT proposal: "A Critical Test of Starvation: the L-Z relation at intermediate redshift"

Data Analysis

- Working with summer student Soyoung Kim on "The Resolved Stellar Population in NGC1569"

Papers/Talks/Posters

- Homeier et al. "The Transformation of Cluster Galaxies at Intermediate Redshifts," ApJ, submitted.
- Homeier et al., "A Quantitative Morphological Comparison of Spiral Galaxies in 4 Clusters at $z \sim 0.8$ " (paper in preparation)

- September 2004, Starbursts from 30 Doradus to Lyman Break Galaxies (Cambridge, UK): “Star-forming Galaxies in Intermediate Redshift Clusters” (poster)

Andre Martel, Ph.D., Astronomer
(70% FTE, 12-1-03 to present)

Operations/Software Development

- Assemble, organize, verify, update, and coordinate the ACS/GTO Phase 1 and 2 science programs and keep in regular contact with the STScI program coordinators for efficient scheduling and late changes. Update the ACS Web pages and spreadsheets.

Data Analysis

- Phase 2 updates and analysis of the data of the ACS/GTO programs “Massive Black Holes in Early-Type Galaxies” and “Imaging of the Host Galaxy of 3C 273”
- Emission-line Imaging of 3C 273 (pipeline processing in progress of the WFC subarrays)
- With graduate student Cristin Rider and Menanteau: identification of AGN candidates as nuclear point sources in galaxies in the deep ACS/GTO fields using GALFIT. Optimization of selection criteria, etc...
- With undergraduate Devin Stith: Web site database of 3CR sources, examination of parallel ACS GTO fields, identification of Chandra X-ray counterparts in ACS GTO observations (when available).

Papers/Talks/Posters

- X-ray selected AGNs in the ACS clusters (morphologies, environments, mergers, spectra of AGN candidates, luminosity functions, ...)
- Web article on the ACS GTO programs in Cassiopeia (Sept issue), the Newsletter of the Canadian Astronomical Society (CASCA).
- Martel et al. 2004, “Dust and Ionized Gas in Nine Nearby Early-Type Galaxies Imaged with the HST Advanced Camera for Surveys”, AJ, in press.
- Martel et al. 2004, “AGN Candidates in the Deep ACS Field of UGC 10214,” AJ, submitted.
- January 2004, AAS Atlanta, on dust and gas in the early types of the ACS black hole program
- Co-author on the other ACS science papers.

Simona Mei, Ph.D., Astronomer
(100% FTE, 06-15-04 to present)

- Analysis of ACS intermediate-redshift cluster data: RXJ0848 at $z=1.27$

Felipe Menanteau, Ph.D., Astronomer
(100% FTE, 12-1-03 to present)

Operations/Software Development

- Learned the Python programming language and put it in practice writing a module for the apsis pipeline.
- Developed and coded a new module for the automatic morphological classification of galaxies, using the Central Concentration and Asymmetry parameters

Papers/Posters/Talks

- Menanteau et al. 2004, "The Nature of Blue Cores in Spheroids: a Possible Connection with AGN and Star Formation," ApJL, submitted.
- Menanteau, F., et al. 2004, "Internal Color Properties of Resolved Spheroids in the Deep HST/ACS Fields of UGC 10214," ApJ, 612, 202.
- Co-author on the other ACS science papers
- January 2004, AAS Meeting: Menanteau et al. "The Morphological Evolution of Distant Galaxies from the ACS/WFC UDF Parallel Observations"

Data Analysis

- Redshift Survey in the UDF parallel field with LDSS2 --We have extracted ~70 spectra of field galaxies, which will be used to re-calibrate the photometric redshift and estimate the star-formation of galaxies as a function of morphology.
- NICMOS Observations of A1689, Benitez et al., Co-PI in the HST proposal.
- with Martel, jointly supervised Cristin Rider. She has been investigating an automated approach for selecting AGN candidates over large areas from deep GTO ACS observations. The methodology is based on multiple fitting galaxy profiles, using the GalFit software.
- Working with Polo's undergraduate student, Victor Serey from PUC, on the clustering properties of galaxies as a function of their morphology from the ACS GTO fields

Gerhardt Meurer, Ph.D., Astronomer (67% FTE, 12-01-2003 to present)

Operations

- Member, ACS pipeline and archive group
- Member, ACS calibration working group at STScI
- Pipeline Quality Assurance tester - I examine about half of the Apsis runs to check if they are acceptable (JPB examines the other half).
- Presented plan for the incorporation of arbitrary non Apsis catalogs at the 2003 Science team meeting. This plan has since been implemented by the ACS pipeline / archive group.

Data Analysis

- Stars in Extended HI Disk Galaxies.
 - completed and published the first paper of this project. The GTO team granted this project three more orbits to observe the galaxy DDO154 (NGC4789A). I completed the initial Phase 2 program for the program in May, 2004, and revised it (as requested by STScI) in June 2004. The DDO154 observations have just arrived, as of this writing.
- ACS GTO grism observations
 - resumed lead on the first ACS-GTO grism paper. This will describe our methods for finding emission line sources and the sources found in the HDF-N.
 - supervising Srinivasan whose focus will now be primarily the UDF parallels.

Papers/Talks/Posters

- STScI Colloquium Speaker, December 3, 2003: "Star Formation in HI selected Galaxies" (invited talk)
- Co-author on several ACS papers.

Veronica Motta, Ph.D., Astronomer
(100% FTE, 04-16-2004 to 08-15-2004)

Observing Runs/Proposals

- Proposal “Deep infrared imaging of ACS fields: search for $z > 7$ galaxies” P.I. Leopoldo Infante, W. Zheng, F. Barrientos, H. Ford, G. Galaz, V. Motta (1 night observed in June 2004).
- Proposal “Search for Emission-Line Signature of Z-Band Dropouts in ACS GTO Cluster Fields” P.I. Leopoldo Infante, W. Zheng, H. Ford, V. Motta, P. Rosati, F. Barrientos, G. Galaz (submitted).
- Proposal “Testing the environmental dependence of the luminosity-metallicity relation at $z=0.8$ ” P.I. Nicole Homeier, P. Rosati, L. Infante, A. Zirm, V. Motta (submitted).

Papers/Talks/Posters

- Spectral data of UDFP obtained in November 2004 in Magellan Clay telescope at Las Campanas (Chile) are successfully reduced. We are writing an article to describe the results.
- Holden et al. 2004, “Evolution in the Cluster Early-type Galaxy Size-surface Brightness Relation at $z=1$,” submitted.

Data Analysis

- Analysis of the spectral data taken with Magellan Clay telescope on 26-27 November 2003 using LDSS-2 spectrograph. Our aim was to study galaxies in the ACS UDFP field.
- Analysis on the infrared data taken with Magellan Båade telescope on February 28- March 3 2004. Our goal was to look for z -droupouts galaxies in the ACS UDFP field.

Wei Zheng, Ph.D., Astronomer
(90% FTE, 12-1-03 to present)

Observing runs and programs

- Preparation of GTO 10334 (Field galaxies around radio quasars) and data analyses
- Two observation trips to Chile for infrared imaging of the ACS cluster fields
- Wrote seven observing proposals for ACS followup, to Magellan, NOAO, VLT and IRTF.

Data Analysis

- Search for high-redshift candidates in the ACS cluster fields.
- Development of algorithms of IR image reduction. Process data from Magellan, Gemini, and VLT

Papers/Talks/Posters

- May 2004, Gemini Science Meeting, (Vancouver, BC): “Search for High-Redshift Objects in Lensed Clusters” (talk)
- Zheng et al., 2004, “High Redshift Galaxies in the Fields of Massive Clusters,” AAS, 205, 148.10.
- Zheng et al. 2004, “Galaxies at Redshift ~ 6 in the Fields of Massive Clusters” (paper in preparation)
- Zheng et al. 2004, “A Host Galaxy of a Radio Quasar at Reshift 5.8” (paper in preparation)

SYSTEMS/TECHNICAL SUPPORT

Terence S. Allen, Software Systems Specialist/Programmer (100% FTE)

- Developed, tested, and implemented several new features of the Science Data Archive (SDA) user interface (versions 1.11 - 1.15.1).
- Continued to maintain all existing features of the SDA user interface and ingestion programs.
- Provided end-user support and served as the contact point for any questions, problems, or suggestions for the SDA.
- Consulted with team scientists regularly to formulate and discuss new ideas for improvements to the SDA.
- Updated, maintained, and improved the data model as needed to support the ingestion of new data into the SDA.
- Performed database administration, configuration, and maintenance tasks as required for the SDA.
- Provided technical input to management for planning, feature, schedule, and release decisions affecting SDA activities as needed.
- Attended and participated in a demonstration of the SDA user interface at the 2004 ADASS XIV conference.

Kenneth Anderson, Sr. Programmer/Analyst (100% FTE)

- See Pipeline and Archive Milestones Sections above.

Alex Framarini, Systems Manager (100% FTE)

- Assisted with installation of hardware and software
- Provides user support
- Maintains printers
- Coordinates computing supplies ordering and set ups.

Wm. Jon McCann, Senior Systems Manager (100% FTE)

- Started a major transition from the now defunct Red Hat Linux to (RHEL 3).
- Started a major transition in our laptop support policies. We moving from supporting a dual boot (Linux / Windows) configuration on Dell laptops to supporting Apple MacOS X on Apple Powerbooks.
- Continued ACS Science Data Archive design and development work.
- Continued to improve my fitscut program that drives all the image functions in the ACS Science Data Archive and is used by team members to produce images and cutouts for papers and presentations.
- Released fitscut to the world as a GPL licensed product.
- Working on a long range project to improve group calendaring scheduling for the ACS team.

- Continued research into next generation tools and current state of the art technologies in order to develop our computing plans.
- Began compiling a formal disaster recover plan.
- Advertised for, hired, and started training a new, part-time computing assistant.
- Provided equipment and support for a number of new ACS Science Team members.
- Updated or installed at least 137 third-party software packages for Linux and Solaris. Transitioned all systems to use 24-bit netmasks. The campus networking group required everyone in the P&A department to make this change.
- Continued moving ACS Team Scientists to workstations that safeguard their home directory with RAID1 mirroring.
- Worked with developers to ensure that future versions of RHEL will have features that the ACS group needs and wants.
- Implemented an output report format for the software installation and configuration database that I designed and created.

STUDENT SUPPORT

Dan Coe, Graduate Student (100% FTE)

Data Analysis/Software Development

- Continued Bayesian photometric redshift (BPZ) analysis of Abell 1689
- Began BPZ analysis of UDF
- Worked with Narciso Benitez to add a new template to BPZ
- Refined implementation of SExSeg, a new program which forces SExtractor to use an input segmentation map
- Used SExSeg to perform photometry on interesting objects in other ACS fields (at the requests of team members)

Papers/Talks/Posters

- January 2004, AAS meeting: "Bayesian Photometric Redshift Analysis of Deep ACS and Ground-based Imaging of Abell 1689" (poster)

Myungkook Jee, Graduate Student (100% FTE)

Data Analysis and Software Development

- Weak lensing measurement on CL 0152, MS 1054, RDCS 1252, and CL 0848.
- Chandra X-ray analyses of CL 0152 and MS 1054.
- Photometric redshift catalog for the UDF field (D. Coe et al. 2004, in prep.)
- Refinement of photometric calibration of ACS

Papers/Talks/Posters

- Jee et al. 2005, "Weak Lensing on CL 0152," ApJ, in press.
- Jee et al. "Weak Lensing and X-ray Analyses on MS 1054," to be submitted to ApJ
- Jee et al. "The Most distant Weak Lensing clusters: CL 0848 and RDCS 1252" (paper in preparation)

- Jee et al. "Weak Lensing Analysis of Two $z \sim 0.8$ Clusters with Advanced Camera for Surveys", 2004 AAS Meeting, Poster Presentation
- Co-author on other ACS papers by Lombardi et al., Goto et al., Homeier et al., Zekser et al. and Sirianni et al.

**Roderik Overzier, Visiting Graduate Student from Leiden University
(100% FTE, 01-15-2004 to present)**

Operations

- phase II planning of ACS GTO observations of MRC1138-262 at $z=2.2$
- phase I+II planning of ACS GO observations of MRC0316-257 at $z=3.1$
- phase I planning of near-infrared observations of MRC1138-262 and MRC0316-257
- phase I+II planning of Chandra observations of MRC0316-257 and TN J1338-1942

Data Analysis

- Analysis of ACS data on TN J1338-1942: Study of a radio-galaxy protocluster at $z=4.1$
- Deep near-infrared observations of TN J1338-1942
- Analysis of ACS data on TN J0924-2201: Study of a radio-galaxy protocluster at $z=5.2$

Papers/Posters/Talks

- "HST/ACS Observations of a Protocluster at $z=4.1$ " (paper in preparation)
- "HST/ACS Observations of a Protocluster at $z=5.2$ " (paper in preparation)
- "Radio galaxy TN J1338-1942" (paper in preparation)
- "Morphological Classification of Protocluster Dropout Galaxies" (paper in preparation)
- Jan 2004, Cosmology Winterschool, Jerusalem, Israel: "ACS Observations of a $z=4.1$ Protocluster" (poster and talk)
- October 2004, CAS Seminar, Johns Hopkins University, Baltimore, MD: "ACS Observations of Galaxies in Protoclusters" (talk)

**Cristin Rider, Graduate Student
(100% FTE, 12-01-2004 to present)**

Data Analysis and Software Development:

- Working on developing a method to identify AGN candidates by modeling galaxy's light curves as a PSF superimposed on top of a sersic, and comparing the flux ratio of each component.

**Sundar Srinivasan, Graduate Student
(100% FTE, 12-01-2004 to present)**

Data Analysis and Software Development

- Analysis of ACS grism data in the Hubble Deep Field North
 - Used emission line candidates and obtained Bayesian photometric redshifts for matched direct image objects in the HDFN for comparison with redshifts obtained by other groups
- Analysis of the Ultra Deep Field parallel (ongoing)
 - Matched grism image objects in 9 different pointings with objects in the drizzled direct image

- aXe spectra obtained for objects in different pointings, to be drizzled using aXe1.4
- Software
 - Working on an automated spectral break finder to obtain redshifts of galaxies with old star populations or Lyman breaks in the HDF

**Manuchehr Taghizadeh-Popp, Graduate Student
(100% FTE, 12-01-2004 to present)**

Data Analysis and Software Development:

- data reduction in the search of z-band dropouts, specifically on coordinate assignments and magnitude zero point calculations in ground based images of galaxy clusters.

**Kerry Zekser, Graduate Student
(100% "co-op" student at STScI working for ACS; 12-1-03 to present)**

Data Analysis and Software Development:

- Cluster modeling of Abell 1689
- Source Reconstruction of Abell 1689
- Advancement of cluster modeling software and of source reconstruction software to reconstruct background galaxies imaged by the cluster lens

Papers/Posters/Talks

- Zekser, K. et al. "Source Reconstruction of Abell 1689 ACS Images," (paper in preparation)
- Zekser, K. et al. "Mass Modeling of Abell 1689 ACS Observations with a Perturbed NFW Model," ApJ, submitted
- Co-author on papers by Broadhurst et al. and Blakeslee et al.
- Zekser, K. et al. 2004, "Mass Modeling of Abell 1689 ACS Observations" IAU Symposium 225, Impact of Gravitational Lensing on Cosmology. Lausanne, Switzerland, Ecole Polytechnique Federale de Lausanne, 19-23 July 2004.
- Zekser, K. et. al. 2005, "Strong Lens Modeling of ACS Observations of Abell 1689" AAS, 203, 120.09.
- Thesis and Dissertation, in preparation.

ADMINISTRATIVE SUPPORT

**Sharon Busching, Sr. Budget Analyst
(70% FTE, 12-1-03 to present)**

- Coordinated third annual ACS science retreat meeting
- Ordered and performed follow-up where necessary on equipment, supplies purchases, and maintenance contracts
- Implemented searches for postdoctoral staff
- Helped assemble budget and proposal for rephase request
- Balanced monthly project budget statements
- Coordinated office space, supplies and payroll for new personnel

ACS RESULTS IN REFEREED PUBLICATIONS SINCE LAST REPORT:

This does not include the papers that were listed in last year's report.

For a list of all ACS papers visit <http://acs.pha.jhu.edu/science/papers>

1. Ardila, D.R., Lubow, S.H., Golimowski, D.A., Krist, J.E., Clampin, M., Ford, H.C., Hartig, G.F., Illingworth, G.D., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R.J., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Cross, N.J.G., Feldman, P.D., Franx, M., Goto, T., Gronwall, C., Holden, B., Homeier, N., Infante, L., Kimble, R.A., Lesser, M.P., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G.K., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2004, **A Dynamical Simulation of the Debris Disk around HD141569**, ApJ, submitted.
2. Ardila, D., Golimowski, D., Krist, J., Clampin, M., Williams, J., Blakeslee, J., Ford, H., Hartig, G., Illingworth, G., 2004, **A Resolved Debris Disk Around the G2 V Star HD 107146**, ApJL, in press.
3. Blakeslee, J.P., Zekser, K.C., Benítez, N., Franx, M., White, R.L., Ford, H.C., Bouwens, R. J., Infante, L., Cross, N.J., Hertling, G., Holden, B.P., Illingworth, G. D., Motta, V., Menanteau, F., Meurer, G.R., Postman, M., Rosati, P., and Zheng, W. 2004, **Advanced Camera for Surveys Observations of a Strongly Lensed Arc in a Field Elliptical Galaxy**, ApJ, 602, 9L.
4. Broadhurst, T., Benítez, N., Coe, D., Sharon, K., Zekser, K., White, R., Ford, H., Bouwens, R., Blakeslee, J., Clampin, M., Cross, N., Franx, M., Frye, B., Hartig, G., Illingworth, G., Infante, L., Menanteau, F., Meurer, G., Postman, M., Ardila, D.R., Bartko, D., Brown, R.A., Burrows, C.J., Cheng, E.S., Feldman, P.D., Golimowski, D.A., Goto, T., Gronwall, C., Herranz, D., Holden, B., Homeier, N., Krist, J.E., Lesser, M.P., Martel, A.R., Miley, G.K., Rosati, P., Sirianni, M., Sparks, W.B., Steindling, S., Tran, H.D., Tsvetanov, Z.I., and Zheng, W. 2004, **Strong Lensing Analysis of A1689 from Deep Advanced Camera Images**, ApJ, in press.
5. Cross, N.J.G., Bouwens, R.J., Benítez, N., Blakeslee, J.P., Menanteau, F., Ford, H.C., Goto, T., Holden, B., Martel, A.R., Zirm, A., Overzier, R., Gronwall, C., Homeier, N., Ardila, D.R., Bartko, F., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Clampin, M., Feldman, P.D., Franx, M., Golimowski, D.A., Hartig, G.F., Illingworth, G.D., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M.P., Meurer, G.R., Miley, G.K., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2004, **The Luminosity Function of Early-Type Field Galaxies at $Z \sim 0.75$** , AJ, 128, 1990.
6. Demarco, R., Rosati, P., Lidman, C., Homeier, N., Scannapieco, E., Benitez, N., Mainieri, V., Nonino, M., Girardi, M., Stanford, S., Tozzi, P, Borgani, S., Silk, J., Squires, G., and Broadhurst, T. 2004, **VLT Spectroscopic Survey of RX~J0152.7-1357, a Forming Cluster of Galaxies at $z=0.837$** , A&A, submitted.
7. Golimowski, D. A., Henry, T. J., Krist, J. E., Dieterich, S., Ford, H. C., Illingworth, G. D., Ardila, D. R., Clampin, M., Franz, O. G., Wasserman, L. H., Benedict, G. F., McArthur, B. E., and Nelan, E. G. 2004, **The Solar Neighborhood IX: Hubble Space Telescope Detections of Companions to Five M and L Dwarfs within 10 pc of the Sun**, AJ, 128, 1733.
8. Goto, T., Postman, M., Cross, N.J.G., Benítez, N., Demarco, R., Homeier, N.L., Martel, A.R., Menanteau, F., Clampin, M., Ford, H.C., Hartig, G.F., Illingworth, G.D., Ardila, D.R., Bartko, F., Blakeslee, J.P., Bouwens, R.J., Bradley, L.D., Broadhurst, T.J., Brown, R.A.,

- Burrows, C.J., Cheng, E.S., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Holden, B., Infante, L., Jee, M.J., Krist, J.E., Lesser, M.P., Mei, S., Meurer, G.R., Miley, G.K., Motta, V., Overzier, R., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., Zheng, W., and Zirm, A. 2004, **The Luminosity Functions of the Galaxy Cluster MS1054-0337 at $z=0.83$** , ApJ, in press.
9. Holden, B., Blakeslee, J., Postman, M., Illingworth, G., Demarco, R., Franx, M., Rosati, P., Bouwens, R., Martel, A., Ford, H., Clampin, M., Hartig, G.F., Benitez, N., Cross, N., Homeier, N., Lidman, C., Menanteau, F., Zirm, A., Ardila, D., Bartko, F., Bradley, L., Broadhurst, T., Brown, R., Burrows, C., Cheng, E., Feldman, P., Golimowski, D., Goto, T., Gronwall, C., Infante, L., Kimble, R., Krist, J., Lesser, M., Magee, D., Mei, S., Meurer, G., Miley, G., Motta, V., Sirianni, M., Sparks, W., Tran, H., Tsvetanov, Z., White, R., Zheng, W. 2004, **Evolution in the Cluster Early-type Galaxy Size-Surface Brightness Relation at $z \cong 1$** , ApJ, submitted.
 10. Homeier, N., Demarco, R., Rosati, P., Postman, M., Blakeslee, J., Bouwens, R., Bradley, L., Ford, H., Goto, T., Gronwall, C., Holden, B., Jee, M., Martel, A., Mei, S., Menanteau, F., Zirm, A., Clampin, M., Hartig, G., Illingworth, G., Ardila, D., Bartko, F., Benitez, N., Broadhurst, R., Brown, R., Burrows, C., Cheng, E., Cross, N., Feldman, P., Franx, M., Golimowski, D., Infante, L., Kimble, R.A., Krist, J., Lesser, M., Meurer, G., Miley, G., Motta, V., Sirianni, M., Sparks, W., Tran, H., Tsvetanov, Z., White, R., and Zheng, W. 2005, **The Transformation of Cluster Galaxies at Intermediate Redshift**, in press.
 11. Jee, M.J., White, R.L., Benítez, N., Ford, H.C., Blakeslee, J.P., Rosati, P., Demarco, R., Illingworth, G.D. 2004, **Weak Lensing Analysis of the $Z \sim 0.8$ cluster CL 0152-1357 with the Advanced Camera for Surveys**, ApJ, (1 January 05 Issue).
 12. Krist, John E., Ardilla, D.R., Golimowski, D.A., Clampin, M., Ford, H.C., Illingworth, G.D., Hartig, G.F., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R.J., Bradley, L.D., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Cross, N.J.G., Demarco, R., Feldman, P.D., Franx, M., Goto, T., Gronwall, C., Holden, B., Homeier, N., Infante, L., Kimble, R.A., Lesser, M.P., Martel, A.R., Mei, S., Menanteau, F., Meurer, G.R., Miley, G.K., Motta, V., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., Zheng, W. 2004, **HST/ACS Coronagraphic Imaging of the AU Microscopii Debris Disk**, AJ, accepted.
 13. Magee, D., Holden, B., Bouwens, R., Illingworth, G., Blakeslee, J.P., and Ford, H., **Supernova 2004bx**, IAU Circ., 8347.
 14. Martel, A.R., Ford, H.C., Bradley, L.D., Tran, H.D., Menanteau, F., and Tsvetanov, Z.I., Illingworth, G.D., Hartig, G.F., and Clampin, M. 2004, **Dust and Ionized Gas in Nine Nearby Early-Type Galaxies Imaged with the HST Advanced Camera for Surveys**, AJ, in press (December 2004).
 15. Martel, A.R., Menanteau, F., Ford, H.C., Cross, N.J.G., and Sirianni, M. 2004, **AGN Candidates in the ACS Field of UGC 10214**, AJ, submitted.
 16. Menanteau, F., Martel, A.R., Tozzi, P., Frye, B., Ford, H.C., Infante, L., Benítez, N., and Galaz, G. 2004, **The Nature of Blue Cores in Spheroids : A Possible Connection with AGN and Star Formation**, ApJL, submitted.
 17. Mieske, S., Infante, L., Benítez, N., Coe, D., Blakelee, J.P., Zekser, K., Ford, H.C., Broadhurst, T.J., Illingworth, G.D., Hartig, G.F., Clampin, M., Ardila, D.R., Bartko, F., Bouwens, R.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Cross, N.G.J., Feldman, P.D., Franx, M., Golimowski, D.A., Goto, T., Gronwall, C., Holden, B., Homeier, N., Kimble,

- R.A., Krist, J.E., Lesser, M.P., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G.K., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2004, **Ultra Compact Dwarf Galaxies in Abell 1689: A Photometric Study with ACS**, AJ, 128, 1529.
18. Mieske, S., Infante, L., Hilker, M., Hertling, G., Blakeslee, J., Benitez, N., Ford, H. and Zekser, K. 2004, **Discovery of Two M32 Twins in Abell 1689**, A&A, submitted.
19. Postman, M., Franx, M., Cross, N., Holden, B., Ford, H., Illingworth, G., Goto, T., Demarco, R., Rosati, P., Blakeslee, J., Tran, K.-V., Clampin, M., Hartig, G., Homeier, N., Ardila, D., Bartko, F., Benitez, N., Bouwens, R., Bradley, L., Broadhurst, T., Brown, R., Burrows, C., Cheng, E., Feldman, P., Golimowski, D., Gronwall, C., Infante, L., Kimble, R., Krist, J., Lesser, M., Martel, A., Mei, S., Menanteau, F., Meurer, G., Miley, G., Motta, V., Sirianni, M., Sparks, W., Tran, H., Tsvetanov, Z., White, R., and Zheng, W. 2004, **The Morphology-Density Relation in $z \sim 1$ Clusters**, ApJ, submitted.
20. Zekser, K.C., White, R.L., Broadhurst, T.J., Benítez, N., Ford, H.C., Illingworth, G.D., Blakesless, J.P., Postman, M., Jee, M.J., Coe, D.A. 2004, **Mass Modeling of Abell 1689 ACS Observations with a Perturbed NFW Model**, ApJ, submitted.

CONFERENCE PROCEEDINGS:

1. Ford, H., Postman, M., Blakeslee, J., Demarco, R., Jee, M., Rosati, P., Holden, B., Homeier, N., Illingworth, G., and White, R. 2004, **The Evolutionary Status of Clusters of Galaxies at $z \sim 1$** , in "Penetrating Bars through Masks of Cosmic Dust - The Hubble Tuning Fork strikes a New Note," Eds: D. Block, I. Puerari, K.C. Freeman, R. Groess, E.K. Block, Kluwer Publishers, Astrophysics and Space Science Library, Volume 319.

TALKS:

1. Meurer, G. 2003, "Star Formation in HI selected Galaxies," STScI Colloquium, December 3, 2004, Baltimore, MD.
2. Ford, H. 2003, "HST ACS Observations of Debris Disks and Searches for Extrasolar Planets: A Progress Report," Advanced School on Extrasolar Planets and Brown Dwarfs, December 2004, Santiago, Chile.
3. Ford, H. 2004, "Early Results from the ACS Science Team: The Evolution of Galaxies and Clusters of Galaxies from $z \sim 6$ to the Present," Penn State University, College Station, PA.
4. Benitez, N., 2004, "Pipeline Presentation," February 2004, Granada, Spain
5. Ford, H. 2004, "The Evolutionary Status of Clusters of Galaxies at $z \sim 1$," at a symposium in honor of Prof. Donald Osterbrock's 80th birthday, July 2004, University of Santa Cruz, Santa Cruz, CA
6. Ardila, D. 2004, "Debris Disks and Planet Formation," July 2004, Rice University
7. Ford, H. 2004, "The Evolutionary Status of Clusters of Galaxies at $z \sim 1$," at BARS conference, "Penetrating Bars through Masks of Cosmic Dust - The Hubble Tuning Fork strikes a New Note," July 2004, Pilanesburg, South Africa.
8. Ardila, D. 2004, "Resolved Coronagraphic Observations of Debris Disks," October 2004, IPAC.
9. Overzier, R. 2004, "ACS Observations of Galaxies in Protoclusters," October, 2004, CAS Seminar, Johns Hopkins University, Baltimore, MD.

10. Ford, H. 2004, "The Advanced Camera for Surveys: Lessons Learned," at Rochester Institute of Technology, November 2004, Rochester, NY.
11. Ford, H. 2004, "The Evolutionary Status of Clusters of Galaxies at $z \sim 1$," at Rochester Institute of Technology, November 2004, Rochester, NY.
12. Zheng, W. 2004, "Search for High-Redshift Objects in Lensed Clusters," Gemini Science Meeting, May 2004, Vancouver, BC

ABSTRACTS/POSTERS:

1. Allen, T., Anderson, K. and McCann, Wm. J., **ACS GTO Science Data Archive Visualization Tools**, demo at the ADASS XIV meeting, October 2004, Pasadena, CA.
2. Ardila, D., Golimowski, D., Krist, J., Clampin, M., Williams, J., Blakeslee, J., Ford, H., Hartig, G., Illingworth, G., 2005, **A Resolved Debris Disk Around the G2V Star HD 107146**, AAS, 205, 127.08.
3. Ardila, D. 2004, **Dynamical Simulation of the Debris Disk around HD141569**, 2nd TPF Darwin Conference, July 2004, San Diego, CA.
4. Blakeslee, J.P., Postman, M., Ford, H.C., Franx, M., Illingworth, G., Rosati, P., Holden, B.P., Demarco, R., and the ACS Investigation Definition Team, 2004, **Update on the ACS Intermediate Redshift Cluster Survey**, AAS, 204. 9.05.
5. Bouwens, R., Illingworth, G., Thompson, R. **High Redshift Galaxy Evolution from the HUDF + Parallel Fields**, AAS 205, 128.07.
6. Dow-Hygelund, C., Illingworth, G., Holden, B., Bouwens, van der Well, A., Franx, M. 2005, **Spectroscopic Confirmation of $z \sim 6$ i-band Dropout Galaxies in the RDCSJ1252-1927 and UDF-Parallel ACS Fields**, AAS, 205, 94.19.
7. Golimowski, D., Krist, J., Ardila, D., Clampin, M., Ford, H., Illingworth, G., and the ACS GTO Team, **Multiband ACS Coronagraphic Imaging of the Debris Disk around Beta Pictoris**, AAS, 205, 17.11.
8. Goto, T. and HST/ACS Team, **Velocity Dispersions of Six Galaxy Clusters at $0.83 < z < 1.24$: Is Ram-Pressure Stripping Responsible for Cluster Galaxy Evolution?** AAS, 205, 161.03.
9. Homeier, N. 2004, **Star-forming Galaxies in Intermediate Redshift Clusters, at Starbursts from 30 Doradus to Lyman Break Galaxies**, September 2004, Cambridge, UK.
10. Krist, J., Ardila, D., Golimowski, D., Clampin, M., Ford, H., Illingworth, G., Hartig, G., and the ACS Science Team, 2005, **HST/ACS Coronagraphic Observations of the AU Mic Debris Disk**, AAS, 205, 17.12.
11. McCann, Wm. J., **Using FITSCUT to Create Color Images**, ADASS XIV meeting, October 2004, Pasadena, CA.
12. Menanteau, F., Martel, A., Tozzi, P., and Frye, B. 2005, **The Nature of Blue Cores in Spheroids: A Possible Connection with AGN and Star Formation**, AAS, 205, 94.08.
13. Postman, M. and the ACS Science Team, 2005, **The Morphology-Density Relationship in $z \sim 1$ Galaxy Clusters**, AAS, 205, 38.04.
14. Zekser, K.C. et. al. 2004, **Mass Modeling of Abell 1689 ACS Observations**, IAU Symposium 225, Impact of Gravitational Lensing on Cosmology. Lausanne, Switzerland, Ecole Polytechnique Federale de Lausanne, 19-23 July 2004.
15. Zheng, W., Ford, H., Postman, M., Infante, L., Motta, V., and the ACS Science Team, 2005, **Galaxies at Redshift ~ 6 in the Fields of the Massive Clusters**, AAS, 205, 148.10.

16. Zirm, A., Overzier, R., Miley, G., and the ACS/IDT Team, 2005, **Feedback and Brightest Cluster Galaxy Formation**, AAS 205, 119.02.

SUBCONTRACTS

Bartko Science and Technology

P.I. of subcontract: Frank Bartko

Accomplishments:

I prepared a presentation for the ACS Aspen Science Workshop: "Galaxy mergers in 2 Clusters at $z=0.83$ ". Unfortunately, I missed the workshop since I contracted the flu virus. I had also prepared a draft of a paper entitled "A Comparison of Merger/Interaction Characteristics of 2 cluster at a redshift of $z=0.83$ ". I am currently revising the draft based on review comments.

On-going work toward specific goals:

- I have continued working on a project with Holland Ford and Marc Postman utilizing the ACS Cluster Data Set to investigate merger fractions and spatial, color, and frequency characteristics of mergers/interactions over a broad range of redshifts.
- I am continuing to work on a revision of a draft paper entitled "A Comparison of Merger/Interaction Characteristics of 2 cluster at a redshift of $z=0.83$ ". I have worked with Marc Postman and Holland Ford to revise the draft and prepare it for circulation and review amongst the ACS Science Team.

Relevant Papers/Reports submitted, in-press and in preparation:

- Paper 1 in preparation on Comparison of Galaxy Merger Characteristics in 2 Clusters at $z=0.83$.
- Paper 2 in planning on Galaxy Merger Characteristics as a Function of Redshift.

Purchases/Expenditures Charged to Grant:

- 1 Trip-Travel to JHU, Baltimore, Md to collaborate with ACS Science Team members.

University of California, Santa Cruz

P.I. of subcontract: Garth Illingworth

Personnel:

Postdoc Rychard Bouwens, Research Associate/Programmer Dan Magee and Postdoc Brad Holden were supported by the ACS program during 2004. Postdoc Kim-Vy Tran continues to work with the team on some of the cluster programs. Dan Kelson, a staff member at the Carnegie Observatories (OCIW) in Pasadena became involved in the cluster program during 2004. The support for Tran and Kelson is quite small, extending to limited travel and to the partial cost of team-related publications in which they are involved. Physics Graduate Student Corey Dow-Hygelund has also been partially supported during this period (summer and fall 2004).

Major activities:

This year was the second year of the science program following launch in early 2002. The remarkable promise of the ACS has been fully realized this last year. The dramatic, high quality images from the ACS have formed the basis for numerous publications over the last 12 months. The deputy-PI continued his extensive support for the program, working closely with the PI to ensure that the science program met its objectives; the team publication record has been excellent this year. Following the successful launch of the ACS early in 2002, the Santa Cruz group focused first on data calibration issues, and then on exploring and recovering science from the first series of science images, particularly from the ERO data and the first cluster program results. We are now focusing on obtaining science results and publications from the GTO data.

The deputy-PI continues to work closely with the PI in defining and supporting the program, and working with the science team members to help set the broad direction of the ACS GTO science program across all its facets. The deputy-PI has been obtaining Keck time and continues to submit Keck proposals for LRIS and DEIMOS time in support of the ACS GTO cluster program. These data from these observations will be available to the team as a resource for those working on the cluster program.

The UCSC team members have contributed as follows:

Brad Holden has finished a project on the scaling relations of high redshift early-type galaxies. Two papers have been submitted to the Astrophysical Journal, "The Fundamental Plane of Cluster Ellipticals at $z=1.25$ " and "Evolution in the Cluster Early-type Galaxy Size-Surface Brightness Relation at $z \sim 1$ " based on this work. The first paper more than doubled the galaxy sample at high redshift ($z \sim 1.25$) which had fundamental plane determinations. The second paper utilized a complementary approach to characterizing galaxy evolution in our cluster sample (complementary to the use of the color-magnitude diagram). This paper again reinforced that a significant fraction of high mass galaxies are essentially fully formed by early times. The techniques developed in this paper will be of great utility in future studies.

Recently, Brad Holden has begun two new projects. The first builds on the work above, being a survey of the fundamental plane at $z=1.3$, while the second is focused on the distribution of morphology as a function of stellar mass at $z=0.8-0.9$. Both projects are aimed at quantifying the stellar mass in galaxies in the cluster environment, and characterizing the properties of cluster members by galaxy mass and star formation history. At low redshifts, galaxy stellar mass has been shown to strongly correlate with color and morphology. Using spectra and near-infrared photometry, Brad will measure the stellar mass at $z=0.8$ and $z=1.3$, and investigate the evolution with the observed morphology from the ACS imaging data. The Fundamental Plane measurements already available at $z=0.8$ will allow a calibration of stellar mass measurements, and the planned Fundamental Plane measurements at $z=1.3$ will extend this to higher redshifts. The plan for the next year is to write a paper on the morphology and color of cluster galaxies as a function stellar mass at $z=0.9$ and a second paper on the Fundamental Plane at $z=1.3$ using a sample three or four times larger than has been used to date. In addition to the work on these important projects, Brad is playing a key role in the Keck ground-based program to determine cluster membership, leveraging his previous experience with cluster redshift surveys. These data will be a resource for the ACS team members.

Rychard Bouwens has made further improvements to his BUCS software suite for quantifying galaxy evolution. This software has proven to be of significant value to many ACS GTO team members, and Rychard has worked with many team members over the year to provide them with reference sets of cloned images for their particular program. This has been the case for both the field and cluster studies that have been carried out by team members. The improved BUCS will allow team members to simply and easily extract scientifically-useful galaxy samples from deep galaxy images and then project them to another redshift to facilitate inferences about changes in galaxy properties. This past year, one of the most notable improvements made to this software suite has been the migration of its capabilities to the web so that it could be more easily used by team members - and, of course, by the broad astronomical community. Dan Magee has also been involved with these efforts, and Bouwens and Magee have presented their combined efforts at the Astronomical Data Analysis Software and Systems conference this past October in Pasadena.

On the science side, Rychard Bouwens has continued his work on galaxies forming at the earliest epochs of the universe, less than two billion years after the big bang. This work builds on the pioneering effort in the paper last year from the deep ACS GTO cluster field RDCS1252-2927. His studies have centered on understanding the many diverse aspects of these objects, from their overall prevalence and luminosity functions to more object-specific properties like their linear sizes and ultraviolet colors. His work on the linear sizes of galaxies have shown that these objects are smaller at earlier times than later on in the universe. He also demonstrated that our census of the high redshift universe was not overly biased by the absence of lower surface brightness objects. This year, he also produced the first accepted paper on a sample of objects at $z \sim 7-8$, the earliest known sample to date. He has also written two papers on galaxies at $z \sim 6$, which is slightly later in the evolution of the universe. Importantly, his results have been leveraging the newly available data from a variety of fields, with particular emphasis on the Hubble Ultra Deep Field and the UDF parallel fields. These fields collectively constitute our deepest looks in the optical and infrared skies.

Dan Magee has continued work on the development of the data analysis pipeline (APSYS) which is used to automatically process the GTO program observations. His recent focus has been in the integration of software which enhances APSIS current capabilities. This includes tools to mask out bad data, minimize runtime data storage requirements, and provide simple batch downloading of final APSIS data products. He also continues work with GTO archive team with development of software for ACS Science Data Archive including WBUCS which provides a simple web-based interface for generating ACS image simulations. The WBUCS simulator was presented at the 2004 ADASS conference on astronomy software. Dan continues to provide system administration and support on Linux and Macintosh platforms for the UCSC component of the GTO team. His duties include maintaining and upgrading systems and equipment, troubleshoot and repair of malfunctioning equipment, and install, manage and support astronomy and scientific software packages. He also provides assistance in evaluation and implementation of new technologies which may benefit the GTO team. Dan also provides support in the planning and implementation of ACS and ground base observations of GTO targets. Being an experienced observer, he assists in all aspects of collecting data using the Keck 10-meter telescopes. This includes generation of the astrometric solutions for the fields and mask production, mask designs for multi-object spectroscopy and in the processing and reduction of

the data collected. The ground-based observations with Keck are a key part of the complementary data needed to analyze the ACS GTO data.

Dan Magee has also been processing the data for CL1358+62 and its strongly lensed arc at $z=4.92$. The Keck spectroscopic data for this object will be combined with the deep ACS imaging data to do a detailed source plane reconstruction data of this high redshift galaxy. The datasets and modeling will be published in a team paper led by the Garth and Marijn Franx working with Dan Magee, Rycharde Bouwens and other GTO team members.

Graduate student Corey Dow-Hygelund has been working through sets of VLT and Keck multi-slit spectroscopic data to derive redshifts for a sample of $z\sim 6$ galaxies. A first paper is undergoing internal review and will be distributed more widely to in the near future. Corey has begun work on a second paper detailing the analysis of the high S/N continuum spectra obtained on a $z\sim 6$ galaxy. This remains a unique object since most of the data obtained on such high redshift galaxies only has S/N suitable for the detection of emission lines (Lyman alpha).

Kim-Vy Tran's continues to be involved through her contributions on MS1054. She supplied her extensive Keck redshift catalog to the GTO team and is now part of projects designed to test the morphology-density relation at high redshift and the star formation rates in the cluster environment. She will be involved in the efforts to characterize the cluster population by mass.

Dan Kelson realized a year ago that the GTO cluster dataset provided an ideal basis for a program to investigate the nature of galaxies in the transition region between the densest regions of massive clusters and the field. He successfully obtained HST GO to extend the ACS imaging coverage around MS1054 to much larger radii. Earlier this year the GTO team cluster group realized that a similar study around RDCS0152 at the same redshift as MS1054 would provide a valuable cross-check on the generality of the results from Dan Kelson's MS1054 GO program. A collaboration was set up with Dan Kelson and similar GTO data obtained on RDCS0152. Kelson will provide redshifts and IR imaging of both clusters to the team.

The deputy-PI has continued overseeing the efforts of the group, working closely with the individual members on planning and implementing the science programs. Extensive time and effort has been committed also to developing the team's overall science program in conjunction with the PI, as well as working with the PI to ensure that the science data processing techniques, the software resources, the science database, and the team personnel are being utilized effectively for our program. These responsibilities have required many trips to be taken to Baltimore to work with the PI at JHU.

The deputy-PI has also been very active this year in working with the PI on getting the first science results out at workshops, and making the results of the ACS GTO program visible to the community. An invited talk was given at a major workshop on the nature of galaxies at low and high redshift. The GTO data featured prominently in an Invited public lecture in Monterey.

Several Keck observing runs were also supported where the data and the science results will be used for our ACS science program -- the spectroscopic data will be used to derive redshifts to constrain the evolution of galaxies in the cluster environment at for high redshift clusters (those

at redshifts $z > 0.5$), and to calibrate the photometric redshifts and properties of the $z \sim 6$ galaxies detected in several ACS fields. Such data will provide the baseline on which we will build our higher redshift ACS cluster results. In addition, we are starting a detailed analysis of the cluster pair in the Lynx GTO field, CL0848. This will include getting deep high S/N spectroscopic data suitable for doing fundamental plane work at high redshift.

The efforts and activities of the UCSC group are structured so as to allow us to have (1) a scientific program that keeps current with the latest developments in our field so that we can ensure that our observational program is up-to-date, and is focused on contemporary issues and questions, and (2) supports the team's efforts in getting scientific results out from the new ACS data as quickly as possible.

The upcoming year will continue with a focus on getting papers out on the ACS GTO data.

Significant equipment purchases and updates:

Some of the desktop and laptop systems were upgraded during the year to take advantage of significant improvements in personal computer hardware (memory, disk drives etc...) as the processing etc requirements increased with the new data. Towards the end of the year we began a wholesale switch to Apple G5 systems for desktop machines and G4 Powerbooks for laptops. Our preliminary experience with the early G4 Apple systems and our first G5 system led to the realization that these systems offered many advantages for the group. The stability of the software and the availability of interfaces make this a reasonable choice for environments needing both unix capability and more general software tools, in addition to well-developed drivers for hardware devices. The lessened support requirements relative to Linux systems have enabled Dan Magee to concentrate more on ACS and Keck data processing. Two Apple G4 Powerbooks and three G5 desktop systems have been acquired.

Space Telescope Science Institute
P.I. of subcontract: Marc Postman

Marc Postman

Marc Postman Completed the analysis of the morphology-density relation (MDR) and morphology-radius relation (MRR) in the seven $z \sim 1$ clusters, observed as part of our ACS GTO program to study galaxy formation and evolution in dense environments. Simulations and independent comparisons of the team's visually derived morphologies indicate that ACS allows one to distinguish between E, S0, and spiral morphologies down to $F850LP = 24$ mag, corresponding to $L/L^* = 0.21$ and 0.30 at $z = 0.83$ and $z = 1.24$, respectively. Adopting density and radius estimation methods that match those used at lower redshift, we achieved important new constraints on the evolution of the MDR and MRR. We detect a change in the MDR between $0.8 < z < 1.2$ and that observed at $z \sim 0$, consistent with recent work -- specifically, the growth in the bulge-dominated galaxy fraction, f_{E+S0} , with increasing density proceeds less rapidly at $z \sim 1$ than it does at $z \sim 0$. At $z \sim 1$ and $\Sigma \geq 500$ galaxies/Mpc², we find $\langle f_{E+S0} \rangle = 0.72 \pm 0.10$. At $z \sim 0$, an E+S0 population fraction of this magnitude occurs at densities about 5 times smaller. The evolution in the MDR is confined to densities of $\Sigma \geq 40$ galaxies/Mpc² and appears

to be primarily due to a deficit of S0 galaxies and an excess of Spiral+Irr galaxies relative to the local galaxy population. The elliptical galaxy fraction -- density relation exhibits no significant evolution between $z = 1$ and $z = 0$. We find mild evidence to suggest that the MDR is dependent on the bolometric x-ray luminosity of the intracluster medium. The slower growth of the early-type population fraction with increasing density that is observed at $z \sim 1$ is a clear signature of the effect of dense environments on the galaxy evolution process. The paper discussing these results was submitted for publication on November 4, 2004.

Postman supervised the work of post-doctoral fellow Tomo Goto on the determination of the ACS-based luminosity function (LF) of the massive $z = 0.83$ cluster MS1054-0321. Our findings are: (i) the faint-end slope of the LF is steeper for bluer filters; (ii) the LF in the inner part of the cluster (or high density regions) has a flatter faint-end slope; (iii) the fraction of early-type galaxies is larger at the bright end of the LF, and gradually decreases toward fainter magnitudes. These characteristics are consistent with those in local galaxy clusters, i.e., the well-known characteristics of cluster LFs are already established at $z = 0.83$, suggesting that massive clusters form at redshifts considerably greater than unity. Furthermore, we have found a possible deficit of faint red galaxies ($i-z > 0.5$, $M_I > -19$) at a 2σ level when we divide LFs by color. Although the significance is marginal, this trend may suggest that faint, red galaxies have not yet been created in the cluster at $z = 0.83$, and will be created between $z = 0.83$ and 0. The giant-to-dwarf ratio dramatically starts to change at around $R = 0.9$ Mpc or >40 galaxies/Mpc², coinciding with the environment where the galaxy star formation rate begins to change and where the MDR starts to appear. A physical process that begins to become effective at around $R = 0.9$ Mpc or >40 galaxies/Mpc² may be responsible for the cluster galaxy evolution. The paper discussing these results has now been accepted for publication in the *Astrophysical Journal*.

Postman gave three invited talks this year on ACS results, one of which was for the STScI Public Night Lecture series entitled "ACS: A New Window on the Cosmos." The other two talks were colloquia at Rutgers University and the Space Telescope Science Institute, summarizing the latest work on our intermediate cluster survey.

Postman was co-I on several observing proposals related to our GTO program including two successful HST Cycle 13 GO proposals - NICMOS Observations of Abell 1689 and NICMOS Observations of a Protocluster of Galaxies at $z = 2.16$. Ground-based proposals submitted this year included UKIRT: NIR Observations of the galaxy cluster RXJ0910+5422 ($z=1.10$), Gemini 8m: Tracing Star-Formation in a $z=0.83$ Rich Galaxy Cluster (H-alpha imaging), Subaru 8m: Spectroscopy of RXJ0910+5422 ($z=1.10$), VLT: A Complete Census of Star-Formation in Two Distant Galaxy Clusters, Gemini 8m: NIR Imaging of High-Redshift Lensed Arcs. Postman also attended the annual off-site ACS science team meeting, held this year in Aspen.

Papers submitted or accepted for publication (within past year):

1. *The Luminosity Function of the Rich $z=0.83$ Cluster, MS1054-0321*. Goto, T., et al. 2004, *ApJ*, accepted for publication.
2. *Mass Modeling of Abell 1689 ACS Observations with a Perturbed NFW Model*. Zekser, K. C., White, R. L., Broadhurst, T. J., Benitez, N., Ford, H. C., Illingworth, G. D., Blakeslee, J. P., Postman, M., Jee, M. J., Coe, D. A., 2004, *ApJ*, submitted.

3. *The Morphology-Density Relation in z~1 Clusters*. Postman, M. et al., 2004, ApJ, submitted.

John Krist

- Developed Cycle 13 Phase 2 circumstellar disk program proposal 10330.
 - Wrote Phase 2 program.
 - Interacted with Spitzer MIPS team to obtain new disk candidates.
 - Participated in selection of targets.
- Processed (PSF subtraction) Cycle 12 & 13 ACS coronagraph images.
- Analyzed ACS coronagraph images of the edge-on disk around AU Mic:
 - Presented results at the TPF Extrasolar Planets and Disks meeting in San Diego.
 - 1st author on AU Mic paper submitted to and accepted by the *Astronomical Journal* (Feb 2005 publication date).
 - Developed upcoming press release on AU Mic.
- Participated in analysis of HD 107146 and Beta Pictoris disks ACS images, including helping develop press release on HD 107146.
- Continued work on ACS images of GG Tau disk (paper nearly complete).

R. White

R. White is supervising two JHU graduate students, James Jee and Kerry Zekser, who are writing Ph.D. theses on the topic of gravitational lensing using ACS data. Jee is analyzing weak lensing (which produces slightly distorted galaxy images) from ACS observations of z~1 clusters to derive mass models for those cluster. He has one paper in press and another in preparation. He has some very interesting results regarding the differences between the distribution of the mass (which is dominated by dark matter), the galaxies, and the hot X-ray emitting gas that fills the space between the galaxies. This is the only approach for directly measuring the dark matter distribution, and the ACS images are much better than previously available observations due to their high sensitivity and high resolution.

Zekser is analyzing the ACS observations of strongly lensing clusters. The gravity from clusters of galaxies deflects the light coming from background galaxies and acts as a gravitational lens. The resulting images are often spectacular, with magnifications greater than a factor of 100 and distorting small galaxy images into very long, thin arcs. White developed a new mass modelling program, based on ideas by Broadhurst but with some significant improvements, and applied it to observations of Abell 1689. Zekser made various important improvements to White's lens modelling program and developed new programs that allow construction of deblended source images. She applied it to Abell 1689 (one paper submitted and one in preparation) and plans to apply it to other strongly lensing clusters to be observed as part of the ACS GTO program. She is studying the mass distribution in the clusters, the magnified images of background galaxies, and the cosmological constraints that can be derived when there are multiply lensed images of background sources at a range of redshifts.

White is also developing data analysis techniques for planet detection near bright stars using the HRC coronagraph. Working with Sparks, he has extended the technique of spectroscopic deconvolution (Sparks & Ford) to handle the special characteristics of our observations of Alpha

Cen. Two bright stars, Alpha Cen A and B, are seen in the field of view, which complicates matters, and the HRC red halo leads to variations in the point-spread function at long wavelengths that must be included in the analysis. This work is continuing but early results are promising. We expect to set an interesting limit on the presence of gas giant planets in this system (assuming that we do not actually detect such planets.)

GSFC

P.I.: Randy Kimble

- No effort reported.

PI: M. Clampin

- No effort reported.

Efforts by our Off-site Collaborators (not subcontractors)

Thomas J. Broadhurst, Ph.D., Astronomer
(The Racah Institute of Physics, Hebrew University)

- Broadhurst, et al. 2004, Strong Lensing Analysis of A1689 from Deep Advanced Camera Images, ApJ, in press.

Marijn Franx, Ph.D., Astronomer
(Leiden University)

- planning of future ACS observations
- planning of supporting ground-based observations
- obtaining supporting ground based observations
- science analysis of existing data
- planning and editing of scientific papers
- scientific discussions
- supervision and guidance of postdocs/students

Brenda Frye, Ph.D., Astronomer
(Princeton University)

This summary concerns the ground-based spectroscopic follow-up campaign for the galaxy cluster imaging project of Abell 1689. It involved use of three major observatories: the Keck Observatories, the Very Large Telescope, and Magellan (south). The aims evolved over the course of the observing runs, from targeting the highest redshift candidates to focusing on the multiply-lensed objects, but each case contributed toward the building up of a large redshift sample, the largest by a factor of ten of any other competing survey. My contribution to this project has been to reduce and analyze the sum total of these spectra. In total we have collected 393 coadded spectra, and have discovered the redshifts for 105 objects. The requirement for

determining a redshift is to identify two or more spectroscopic features detected at the four-sigma or more level with respect to the continuum, or, in some cases, one feature combined with a particularly special placement with regard to some other more global property of the spectrum. Details can be found in a paper on the redshift catalog currently in progress for submission to the *Astrophysical Journal*.

One avenue of particular interest is to do detailed intermediate-resolution spectroscopy of the rare Strongly-Lensed Lyman-break Galaxy's (SLLBG). There are only three that are bright enough for higher resolution work, and we have data for two of them. Our lower resolution spectra show it to be rich in interstellar absorption features arising from the host galaxy. Studies of the internal properties of LBG's, via SLLBG's is a new and emerging field, and is important to furthering our understanding of galaxies at even higher redshifts, $z > 6$.

Leopoldo Infante, Ph.D, Astronomy
(Pontificia Universidad Catolica, Santiago, Chile)

Data Analysis

- Infante, Mieske and the ACS science team have investigated Ultra Compact Dwarfs (UCD) in the very massive galaxy cluster Abell 1689. We performed a photometric search for UCD candidates (Mieske et al. 2004a) using high resolution ACS imaging in g,r,i,z. This search resulted in the discovery of several very luminous UCD candidates. For two of these we have confirmed the cluster membership with VLT/MXU. They are found to be analogs of M32 (Mieske et al. 2004b).
- Infante, Wei, Motta, Ford and the ACS science team have searched for z dropouts in deep ACS cluster and field images. The near IR photometry have been done using VLT and Magellan telescopes.
- Dra. Veronica Motta spent 4 months in Baltimore (JHU) as part of the Universidad Catolica - Johns Hopkins collaboration. She is working with Magellan LDSS2 spectra of field galaxies and with Magellan Panic data in the framework of the high z galaxy search project.
- Also as part of this collaboration, the P.U.C. student Victor Serey is currently at JHU working with Dr. Felipe Menanteau. Infante, Mennanteau and Serey are studying the evolution of the galaxy clustering length to $z = 1.2$ in deep ACS GTO images. Follow up spectroscopy is planned for 2005.

Papers/Posters/Talks

- Mieske S., Infante L., Benitez N. et al. (ACS team), 2004a, "Ultracompact Dwarf Galaxies in Abell 1689: a Photometric Study with the ACS," AJ, 128, 1529.
- Mieske S., Infante L., Hilker M., Hertling G., Blakeslee J.P., Benitez N., Ford H., Zekser K. 2004b, "Discovery of two M32 twins in Abell 1689", submitted to A&A Letters.

George Miley, Ph.D, Astronomer
(Leiden University)

Tasks

- Coordination of the distant radio galaxy/protocluster part of the ACS GTO program
 - Planning of the Phase 1 and Phase 2 observations of the ACS distant radio

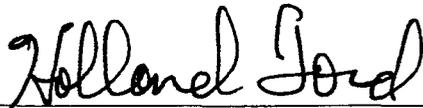
- Galaxy and protocluster program
- Ground-based preparatory and followup observations for the ACS protocluster GTO program
- Reduction and analysis of data from the distant radio galaxy/protocluster part of the ACS GTO program
- Supervision of Leiden-funded ACS postdoc (Zirm) and ACS graduate student (Overzier)
- Interface between the ACS protocluster and cluster programs

Accomplishments

- Lead in planning and inputting the Cycle 12 and Cycle 13 GTO observations of distant radio galaxies/ protoclusters
- Supervised the reduction and analysis of GTO data from the distant radio galaxies 1338-19 ($z = 4.1$) and 0924-22 ($z = 5.2$)
- Lead in a VLT project to obtain ground-based infrared imaging and optical spectroscopic data for the ACS GTO protocluster targets

**Piero Rosati, Ph.D, Astronomer
(ESO)**

Signed: _____



Holland Ford, P.I.

cc: Jim Jeletic, GSFC, c/o B. Matters, Building 7, Room 264B
S. Dezio, GSFC, Code 210, Building 28, Room N130
NASA Ctr. for Aerospace Information
S. Ormond, JHU Krieger School of Arts and Science Research Administration

Advanced Camera

f o r S u r v e y s

JOHNS HOPKINS
UNIVERSITY

Last updated on 15 Oct 2004.

ACS GTO Science Programs	ID	11	Cycle 12	13	Cycle 11 Executed Orbits	Cycle 12 Requested Orbits	Cycle 13 Requested Orbits	Cycle 14 Requested Orbits	Cycle 15 Requested Orbits	Total Orbits
Evolution of Galaxies and Clusters of Galaxies										
Low Redshift Cluster Gravitational Lensing Survey	AC02	9289	9717	10325	23	20	56	-	-	99
Properties of Intermediate Redshift Cluster Galaxies	AC03	9290	9919	10326	76	44	16	-	-	136
Formation of High Redshift Radio Galaxies	AC04	9291	-	-	32	0	0	-	-	32
ACS and NICMOS Imaging of a z=2.2 Protocluster	(AC04)	-	-	10327	0	0	19	-	-	19
		-	-	10338	0	0	8	-	-	8
The Nature of Galaxies at z > 4	AC05	9292	-	-	16	0	0	-	-	16
Photometry and Grism Spectroscopy in HDF North/South	AC16	9301	-	-	16	0	0	-	-	16
i-Band Dropouts around High-z Radio Quasars	AC18	-	-	10334	0	0	18	-	-	18
				Subtotal	163	64	117	-	-	344
Active Galactic Nuclei										
Massive Black Holes in Early Type Galaxies	AC06	9293 (9986)	(10328)		12	1	0	-	-	13
Imaging of the Host Galaxy of 3C 273	AC07	9294	-	-	6	0	0	-	-	6
				Subtotal	18	1	0	-	-	19

Stars and Stellar Systems

ACS GTO Science Programs	ID	Cycle 11	Cycle 12	Cycle 13	Cycle 11 Executed Orbits	Cycle 12 Requested Orbits	Cycle 13 Requested Orbits	Cycle 14 Requested Orbits	Cycle 15 Requested Orbits	Total Orbits
Coronagraphic Search for Planets around Alpha Cen A, B	AC08	-	9703	10329	0	24	12	-	-	36
Stars in Extended HI Disk Galaxies	AC01	9288	-	10287	4	0	3	-	-	7
Coronagraphic Search for Disks around Nearby Stars	AC10	9295	9987	10330	19	22	24	-	-	65
Geometric Measurement of Galaxy Distances	AC14	9299	-	-	12	0	0	-	-	12
Starbursts and their Population of Super Star Clusters	AC15	9300	9989	10332	4	4	2	-	-	10
Investigating the Multiplicity of the L Dwarf LHS 102B	-	-	9990	-	0	1	0	-	-	1
Black Holes in Globular Clusters	AC19	-	-	10335	0	0	3	3	3	9
				Subtotal	39	51	44	3	3	140
Solar System Objects										
Comet Hale-Bopp at Large Heliocentric Distances	AC17	9302	-	-	2	0	0	-	-	2
Jovian Satellites - Ganymede and Europa	AC11	9296	-	-	5	0	0	-	-	5
	AC11	-	-	(10331)	0	0	3	-	-	3
Comets: Gas in the Inner Coma (ToO)	AC12	-	9985	-	0	4	0	-	-	4
				Subtotal	7	4	3	-	-	14
				Priority 1 Total	227	120	164	3	3	517
				Total GTO Orbits						553
				Available GTO Orbits						36

Advanced Camera
f o r S u r v e y s

JOHNS HOPKINS
U N I V E R S I T Y

Science Papers

2004

- Allen, T., Anderson, K. and McCann, Wm. J., **ACS GTO Science Data Archive Visualization Tools**, demo at the ADASS XIV meeting, October 2004, Pasadena, CA.
- Ardila, D.R., Lubow, S.H., Golimowski, D.A., Krist, J.E., Clampin, M., Ford, H.C., Hartig, G.F., Illingworth, G.D., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R.J., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Cross, N.J.G., Feldman, P.D., Franx, M., Goto, T., Gronwall, C., Holden, B., Homeier, N., Infante, L., Kimble, R.A., Lesser, M.P., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G.K., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2004, **A Dynamical Simulation of the Debris Disk around HD141569**, ApJ, submitted.
- Ardila, D., Golimowski, D., Krist, J., Clampin, M., Williams, J., Blakeslee, J., Ford, H., Hartig, G., Illingworth, G., 2004, **A Resolved Debris Disk Around the G2 V Star HD 107146**, ApJL, in press.
- Ardila, D., Golimowski, D., Krist, J., Clampin, M., Williams, J., Blakeslee, J., Ford, H., Hartig, G., Illingworth, G., 2005, **A Resolved Debris Disk Around the G2V Star HD 107146**, AAS, 205, 127.08.
- Benítez, N., Ford, H., Bouwens, R., Menanteau, F., Blakeslee, J., Gronwall, C., Illingworth, G., Meurer, G., Broadhurst, T.J., Clampin, M., Franx, M., Hartig, G.F., Magee, D., Sirianni, M., Ardila, D.R., Bartko, F., Brown, R.A., Burrows, C.J., Cheng, E.S., Cross, N.J.G., Feldman, P.D., Golimowski, D.A., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M.P., Levay, Z., Martel, A.R., Miley, G.K., Postman, M., Rosati, P., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L. and Zheng, W. 2004, **Faint Galaxies in Deep ACS Observations**, ApJS, 150, 1. Document (18 pages, 1.1MB, PDF)
- Blakeslee, J.P., Postman, M., Ford, H.C., Franx, M., Illingworth, G., Rosati, P., Holden, B.P., Demarco, R., and the ACS Investigation Definition Team, 2004, **Update on the ACS Intermediate Redshift Cluster Survey**, AAS, 204, 9.05. Abstract
- Blakeslee, J. P., Zekser, K. C., Benítez, N., Franx, M., White, R. L., Ford, H. C., Bouwens, R. J., Infante, L., Cross, N. J., Hertling, G., Holden, B. P., Illingworth, G. D., Motta, V., Menanteau, F., Meurer, G. R., Postman, M., Rosati, P., and Zheng, W. 2004, **Advanced Camera for Surveys Observations of a Strongly Lensed Arc in a Field Elliptical Galaxy**, ApJ, 602, 9L. Document (4 pages, PDF)
- Bouwens, R., Illingworth, G., Thompson, R. 2005, **High Redshift Galaxy Evolution from the HUDF + Parallel Fields**, AAS 205, 128.07.

Broadhurst, T., Benítez, N., Coe, D., Sharon, K., Zekser, K., White, R., Ford, H., Bouwens, R., Blakeslee, J., Clampin, M., Cross, N., Franx, M., Frye, B., Hartig, G., Illingworth, G., Infante, L., Menanteau, F., Meurer, G., Postman, M., Ardila, D.R., Bartko, D., Brown, R.A., Burrows, C.J., Cheng, E.S., Feldman, P.D., Golimowski, D.A., Goto, T., Gronwall, C., Herranz, D., Holden, B., Homeier, N., Krist, J.E., Lesser, M.P., Martel, A.R., Miley, G.K., Rosati, P., Sirianni, M., Sparks, W.B., Steindling, S., Tran, H.D., Tsvetanov, Z.I., and Zheng, W. 2004, **Strong Lensing Analysis of A1689 from Deep Advanced Camera Images**, ApJ, in press. Document (83 pages, PDF, 1.4MB)

Cross, N.J.G., Bouwens, R.J., Benítez, N., Blakeslee, J.P., Menanteau, F., Ford, H.C., Goto, T., Holden, B., Martel, A.R., Zirm, A., Overzier, R., Gronwall, C., Homeier, N., Ardila, D.R., Bartko, F., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Clampin, M., Feldman, P.D., Franx, M., Golimowski, D.A., Hartig, G.F., Illingworth, G.D., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M.P., Meurer, G.R., Miley, G.K., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2004, **The Luminosity Function of Early-Type Field Galaxies at $Z \sim 0.75$** , AJ, 128, 1990. Document (39 pages, PDF, .7MB)

Demarco, R., Rosati, P., Lidman, C., Homeier, N., Scannapieco, E., Benitez, N., Mainieri, V., Nonino, M., Girardi, M., Stanford, S., Tozzi, P., Borgani, S., Silk, J., Squires, G., and Broadhurst, T. 2004, **VLT Spectroscopic Survey of RX~J0152.7-1357, a Forming Cluster of Galaxies at $z=0.837$** , A&A, submitted.

Dow-Hygelund, C., Illingworth, G., Holden, B., Bouwens, van der Well, A., Franx, M. 2005, **Spectroscopic Confirmation of $z \sim 6$ i-band Dropout Galaxies in the RDCSJ1252-1927 and UDF-Parallel ACS Fields**, AAS, 205, 94.19.

Ford, H., Postman, M., Blakeslee, J., Demarco, R., Jee, M., Rosati, P., Holden, B., Homeier, N., Illingworth, G., and White, R. 2004, **The Evolutionary Status of Clusters of Galaxies at $z \sim 1$** , in Penetrating Bars through Masks of Cosmic Dust - The Hubble Tuning Fork strikes a New Note, Eds: D. Block, I. Puerari, K.C. Freeman, R. Groess, E.K. Block, Kluwer Publishers, Astrophysics and Space Science Library, Volume 319.

Golimowski, D. A., Henry, T. J., Krist, J. E., Dieterich, S., Ford, H. C., Illingworth, G. D., Ardila, D. R., Clampin, M., Franz, O. G., Wasserman, L. H., Benedict, G. F., McArthur, B. E., and Nelan, E. G. 2004, **The Solar Neighborhood IX: Hubble Space Telescope Detections of Companions to Five M and L Dwarfs within 10 pc of the Sun**, AJ, 128, 1733. Document (37 pages, PDF)

Golimowski, D., Krist, J., Ardila, D., Clampin, M., Ford, H., Illingworth, G., and the ACS GTO Team 2005, **Multiband ACS Coronagraphic Imaging of the Debris Disk around β Pictoris**, AAS, 205, 17.11.

Goto, T., Postman, M., Cross, N.J.G., Benítez, N., Demarco, R., Homeier, N.L., Martel, A.R., Menanteau, F., Clampin, M., Ford, H.C., Hartig, G.F., Illingworth, G.D., Ardila, D.R., Bartko, F., Blakeslee, J.P., Bouwens, R.J., Bradley, L.D., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Holden, B., Infante, L., Jee, M.J., Krist, J.E., Lesser, M.P., Mei, S., Meurer, G.R., Miley, G.K., Motta, V., Overzier, R., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., Zheng, W., and Zirm, A. 2004, **The Luminosity Functions**

of the Galaxy Cluster MS1054-0337 at $z=0.83$, ApJ, in press.

Goto, T. and HST/ACS Team, 2004, **Velocity Dispersions of Six Galaxy Clusters at $0.83 < z < 1.24$: Is Ram-Pressure Stripping Responsible for Cluster Galaxy Evolution?** AAS, 205, 161.03.

Homeier, N. 2004, **Star-forming Galaxies in Intermediate Redshift Clusters**, at Starbursts from 30 Doradus to Lyman Break Galaxies, September 2004, Cambridge, UK.

Jee, M.J., White, R.L., Benítez, N., Ford, H.C., Blakeslee, J.P., Rosati, P., Demarco, R., Illingworth, G.D. 2004, **Weak Lensing Analysis of the $Z \sim 0.8$ cluster CL 0152-1357 with the Advanced Camera for Surveys**, ApJ, (1 January 05 Issue). Document (58 pages, PDF, 2.1MB)

Krist, John E., Ardiila, D.R., Golimowski, D.A., Clampin, M., Ford, H.C., Illingworth, G.D., Hartig, G.F., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R.J., Bradley, L.D., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Cross, N.J.G., Demarco, R., Feldman, P.D., Franx, M., Goto, T., Gronwall, C., Holden, B., Homeier, N., Infante, L., Kimble, R.A., Lesser, M.P., Martel, A.R., Mei, S., Menanteau, F., Meurer, G.R., Miley, G.K., Motta, V., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., Zheng, W. 2004, **HST/ACS Coronagraphic Imaging of the AU Microscopii Debris Disk**, AJ, accepted. Document (27 pages, PDF).

Krist, J., Ardiila, D., Golimowski, D., Clampin, M., Ford, H., Illingworth, G., Hartig, G., and the ACS Science Team, 2005, **HST/ACS Coronagraphic Observations of the AU Mic Debris Disk**, AAS, 205, 17.12.

Magee, D., Holden, B., Bouwens, R., Illingworth, G., Blakeslee, J.P., and Ford, H., **Supernova 2004bx**, IAU Circ., 8347. Document

Martel, A.R., Ford, H.C., Bradley, L.D., Tran, H.D., Menanteau, F., and Tsvetanov, Z.I., Illingworth, G.D., Hartig, G.F., and Clampin, M. 2004, **Dust and Ionized Gas in Nine Nearby Early-Type Galaxies Imaged with the HST Advanced Camera for Surveys**, AJ, in press (December 2004). Document (14 pages, PDF, 1.8MB)

Martel, A.R., Menanteau, F., Ford, H.C., Cross, N.J.G., and Sirianni, M. 2004, **AGN Candidates in the ACS Field of UGC 10214**, AJ, submitted.

McCann, Wm.J. 2004, **Using FITSCUT to Create Color Images**, ADASS XIV Meeting, October 2004, San Diego, CA.

Menanteau, F., Ford, H.C., Illingworth, G.D., Sirianni, M., Blakeslee, J.P., Meurer, G.R., Martel, A.R., Benítez, N., Postman, M., Franx, M., Ardiila, D.R., Bartko, F., Bouwens, R.J., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Clampin, M., Cross, N.G.J., Feldman, P.D., Golimowski, D.A., Gronwall, C., Hartig, G.F., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M.P., Miley, G.K., Rosati, P., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2004, **Internal Color Properties of Resolved Spheroids in the Deep HST/ACS Fields of UGC 10214**, ApJ, in press. Document (12 pages, 1.2MB, PDF)

Menanteau, F., Martel, A.R., Tozzi, P., Frye, B., Ford, H.C., Infante, L., Benítez, N., and

Galaz, G. 2004, **The Nature of Blue Cores in Spheroids : A Possible Connection with AGN and Star Formation**, ApJL, in press.

Menanteau, F., Martel, A., Tozzi, P., and Frye, B. 2005, **The Nature of Blue Cores in Spheroids: A Possible Connection with AGN and Star Formation**, AAS, 205, 94.08.

Mieske, S., Infante, L., Benítez, N., Coe, D., Blakelee, J.P., Zekser, K., Ford, H.C., Broadhurst, T.J., Illingworth, G.D., Hartig, G.F., Clampin, M., Ardila, D.R., Bartko, F., Bouwens, R.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Cross, N.G.J., Feldman, P.D., Franx, M., Golimowski, D.A., Goto, T., Gronwall, C., Holden, B., Homeier, N., Kimble, R.A., Krist, J.E., Lesser, M.P., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G.K., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2004, **Ultra Compact Dwarf Galaxies in Abell 1689: A Photometric Study with ACS**, AJ, in press. Document (29 pages, .8MB, PDF - Fig. 10 missing from this file)

Miley, G. K., Overzier, R. A., Tsvetanov, Z.I., Bouwens, R. J., Benítez, N., Blakeslee, J.P., Ford, H.C., Illingworth, G.D., Postman, M., Rosati, P., Clampin, M., Hartig, G. F., Zirm, A. W., Roettgering, H. J. A., Venemans, B. P., Ardila, D. R., Bartko, F., Broadhurst, T. J., Brown, R. A., Burrows, C. J., Cheng, E. S., Cross, N. J. G., De Breuck, C., Feldman, P. D., Franx, M., Golimowski, D. A., Gronwall, C., Infante, L., Martel, A. R., Menanteau, F., Meurer, G. R., Sirianni, M., Kimble, R. A., Krist, J. E., Sparks, W. B., Tran, H. D., White, R. L., and Zheng, W. 2004, **A large population of 'Lyman-break' galaxies in a protocluster at redshift $z \sim 4.1$** , Nature, 427, 47.

Postman M. and the ACS Science Team 2005, **The Morphology Density Relation in $Z \sim 1$ Galaxy Clusters**, AAS, 205, 38.04.

Sparks, W.B., Krist, J.E., Clampin, M., Ford, H.C. 2004, **Planet Detection using the Advanced Camera for Surveys on the Hubble Space Telescope**, IAUS, 213, 107.

Zekser, K.C., White, R.L., Broadhurst, T.J., Benítez, N., Ford, H.C., Illingworth, G.D., Blakeslee, J.P., Postman, M., Jee, M.J., Coe, D.A. 2004, **Mass Modeling of Abell 1689 ACS Observations with a Perturbed NFW Model**, ApJ, submitted.

Zheng, W., Ford, H., Postman, M., Infante, L., Motta, V., and the ACS Science Team, 2005, **Galaxies at Redshift ~ 6 in the Fields of Massive Clusters**, AAS, 205, 148.10.

Zirm, A., Overzier, R., Miley, G., and the ACS/IDT Team, 2005, **Feedback and Brightest Cluster Galaxy Formation**, AAS, 205, 119.02.

2003

Ardila, D.A., Lubow, S.H., Krist, J.E., Golimowski, D.A., Clampin, M., Hartig, G.F., Ford, H.C., and Illingworth, G.D. 2003, **A Dynamical Model of the Debris Disk Around HD141569**, AAS, 203, 1305, submitted. Abstract

Blakeslee, J.P., Anderson, K.R., Meurer, G.R., Benítez, N., and Magee, D. 2003, **An Automatic Image Reduction Pipeline for the Advanced Camera for Surveys**, in ASP Conf. Ser., Astronomical Data Analysis Software and Systems XII, ed. H. Payne, R.

Jedrzejewski, R. Hook, 257. Document (4 pages, PDF)

Blakeslee, J.P., Franx, M., Postman, M., Rosati, P., Holden, B.P., Illingworth, G.D., Ford, H.C., Cross, N.J.G., Gronwall, C., Benitez, N., Bouwens, R.J., Broadhurst, T.J., Clampin, M., Demarco, R., Golimowski, D. A., Hartig, G. F., Infante, L., Martel, A. R., Miley, G. K., Menanteau, F., Meurer, G.R., Sirianni, M., White, R. L. 2003, **Advanced Camera for Surveys Photometry of the Cluster RDCS1252.9-2927: The Color-Magnitude Relation at $z=1.24$** , *ApJL*, 596, 143. Document (6 pages, pdf)

Blakeslee, J.P., Tsvetanov, Z.I., Riess, A.G., Ford, H.C., Illingworth, G.D., Magee, D., Tonry, J.L., Benítez, N., Clampin, M., Hartig, G.F., Meurer, G.R., Sirianni, M., Ardila, D.R., Bartko, F., Bouwens, R., Broadhurst, T., Cross, N., Feldman, P.D., Franx, Marijn, Golimowski, D.A., Gronwall, C., Kimble, R.A., Krist, J., Martel, A.R., Menanteau, F., Miley, G., Postman, M., Rosati, P., Sparks, W., Strolger, L.-G., Tran, H.D., White, R.L., and Zheng, W. 2003, **Discovery of Two Distant Type Ia Supernovae in the Hubble Deep Field North with the Advanced Camera for Surveys**, *ApJ*, 589, 693. Document (11 pages, PDF)

Bouwens, R.J., Illingworth, G.D., Broadhurst, T., Franx, M., Rosati, P., Lidman, C., Ford, H.C., Magee, D., Benitez, N., Blakeslee, J.P., Meurer, G.R., Clampin, M., Hartig, G.F., Ardila, D.R., Bartko, F., Brown, R.A., Burrows, C.J., Cheng, E.S., Cross, N., Feldman, P.D., Golimowski, D.A., Gronwall, C., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M.P., Martel, A.R., Menanteau, F., Miley, G.K., Postman, M., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2003, **Star Formation at $Z\sim 6$: i-dropouts in the ACS GTO Fields**, *ApJ*, 595, 589. Document (14 pages, 1MB, pdf)

Clampin, M., Krist, J.E., Ardila, D.A., Golimowski, D.A., Hartig, G.F., Ford, H.C., Illingworth, G.D., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R.A., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Franx, M., Gronwall, C., Infante, L., Kimble, R.A., Lesser, M., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2003, **HST/ACS Coronagraphic Imaging of the Circumstellar Disk around HD 141569**, *AJ*, 126, 385. Document (22 pages, pdf, 0.11MB)

Coe, D., Benítez, N., Broadhurst, T.J., Zekser, K.C., White, R.L., Frye, B., Ford, H.C., Illingworth, G.D., and the ACS Team 2003, **Bayesian Photometric Redshift Analysis of Deep ACS and Ground-based Imaging of Abell 1689**, *AAS*, 203, 120.05. Abstract

Cross, N., Benítez, N., Gronwall, C., Blakeslee, J.P., Menanteau, F., Bouwens, R., and the ACS Science Team, **The Space Density of Field Galaxies in the ACS-GTO Images, Maps of the Cosmos**, *IAU Symp.* 216, 14-17 July, 2003, Sydney, Australia.

Golimowski, D.A., the NICMOS Nearby Star Survey Team, and the ACS GTO Team 2003, **Discoveries of Faint Companions to Nearby Stars with HST**, *AAS*, 203, 67.02. Abstract

Jee, M., White, R.L., Ford, H.C., Benitez, N., and Illingworth, G.D. 2003, **Weak Lensing Analysis of Two $z\sim 0.8$ Clusters with Advanced Camera for Surveys**, *AAS*, 203, 120.08. Abstract

Martel, A.R., Ford, H.C., Tran, H.D., Illingworth, G.D., Krist, J.E., White, R.L., Sparks, W.B.,

Gronwall, C., Cross, N.J.G., Hartig, G.F., Clampin, M., Ardila, D.R., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R.J., Broadhurst, T.J., Brown, R.A., Burrows, C.J., Cheng, E.S., Feldman, P.D., Franx, M., Golimowski, D.A., Infante, I., Kimble, R.A., Lesser, M.P., McCann, W.J., Menanteau, F., Meurer, G.R., Miley, G.K., Postman, M., Rosati, P., Sirianni, M., Tsvetanov, Z.I., and Zheng, W. 2003, **Coronagraphic Imaging of 3C 273 with the Advanced Camera for Surveys**, AJ, 125, 2964. Document (34 pages, Gzipped PS, 6MB)

Meurer, G.R., Blakeslee, J. P., Sirianni, M., Ford, H. C., Illingworth, G. D., Benitez, N., Clampin, M., Menanteau, F., Tran, H. D., Kimble, R. A., Hartig, G. F., Ardila, D. R., Bartko, F., Bouwens, R. J., Broadhurst, T. J., Brown, R. A., Burrows, C. J., Cheng, E. S., Cross, N. J. G., Feldman, P. D., Golimowski, D. A., Gronwall, C., Infante, L., Krist, J. E., Lesser, M. P., Martel, A. R., Miley, G. K., Postman, M., Rosati, P., Sparks, W. B., Tsvetanov, Z. I., White, R. L., and Zheng, W. 2003, **Discovery of Globular Clusters in the Protospiral Galaxy NGC 2915: Implications for Hierarchical Galaxy Evolution**, ApJ, 599, 83L. Document (4 pages, PDF)

Meurer, G.R., Blakeslee, J.P., Ford, H.C., Illingworth, G.D., Freeman, K.C., Bland-Hawthorn, J., Allen, R.J., Sirianni, M., Clampin, M., Kimble, R., and the ACS Science Team, 2003, **Dim Matter in the Dark Galaxy NGC 2915**, XXV Gen'YI Assembly of the IAU, 13-16 July 2003, Sydney, Australia.

Tran, H.D., Sirianni, M., Ford, H.C., Illingworth, G.D., Clampin, M., Hartig, G., Becker, R.H., White, R.L., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M., Magee, D., Martel, A., McCann, W.J., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sparks, W.B., Tsvetanov, Z. 2003, **ACS Observations of Young Star Clusters in the Interacting Galaxy UGC 10214**, ApJ, 585, 750. Document (6 pages, PDF, 0.23MB)

Zekser, K.C., White, R.L., Broadhurst, T.J., Benítez, N., Ford, H.C., Coe, D., and the ACS Science Team 2003, **Strong Lens Modeling of Advanced Camera for Surveys Observations of Abell 1689**, AAS, 203, 120.09. Abstract

2002

Benítez, N., Broadhurst, T.J., Ford, H.C., Blakeslee, J.P., Illingworth, G.D, Postman, M., Bouwens, R., Coe, D., Tran, H.D., Tsvetanov, Z.I., White, R.L., Zekser, K., and the ACS Science Team 2002, **ACS Observations of A1689**, AAS, 201, 8006. Abstract

Benítez, N., Gronwall, C., Bouwens, IR., Cross, N., Blakeslee, J., Meurer, G. 2002, **Faint Galaxies in Deep ACS Observations**, AAS, 200, 2403. Abstract

Blakeslee, J.P., Tsvetanov, Z.I., Riess, A.R., Benítez, N., Bouwens, R., Clampin, M., Cross, N., Ford, H.C., Franx, M., Golimowski, D.A., Gronwall, C., Hartig, G., Illingworth, G.D., Krist, J.E., Martel, A.R., Meurer, G.R., Postman, M., Sirianni, M., Sparks, W.B., Tran, H.D., White, R.L., Ardila, D., Bartko, F., Burrows, C., Broadhurst, T.J., Brown, R.A., Feldman, P.D., Kimble, R.A., Lesser, M., Menanteau, F., Miley, G., Rosati, P., and Zheng, W. 2002, **The First Supernovae Found with the Advanced Camera for Surveys**, AAS, 201, 12302. Abstract

- Bouwens, R., Illingworth, G.D., Broadhurst, T.J., Magee, D., Ford, H.C., Clampin, M., Hartig, G., Benitez, N., Ardila, D., Bartko, F., Blakeslee, J.P., Brown, R.A., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2002, **Cloning Drop-outs: Implications for Galaxy Evolution from $z \sim 6$ to $z \sim 2$ Using HST ACS/WFPC2 Data**, AAS, 201, 3204. Abstract
- Clampin, M., Krist, J.E., Golimowski, D.A., Ardila, D.R., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R.A., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Ford, H.C., Franx, M., Gronwall, C., Hartig, G.F., Illingworth, G.D., Infante, L., Kimble, R.A., Lesser, M., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2002, **ACS Coronagraphic Observations of the HD141569 Circumstellar Disk**, AAS 201, 2501. Abstract
- Cross, N., Benítez, N., Gronwall, C., Blakeslee, J.P., Menanteau, F., Bouwens, R., Ardila, D.R., Bartko, F., Broadhurst, T.J., Brown, R.A., Burrows, C., Cheng, E., Clampin, M., Feldman, P.D., Ford, H.C., Franx, M., Golimowski, D.A., Hartig, G.F., Illingworth, G.D., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M., Martel, A.R., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2002, **Evolution of Field Galaxies from $0.5 < z < 1.0$ in ACS GTO Cluster Fields**, AAS 201, 5207. Abstract
- Ford, H.C., Illingworth, G.D., Clampin, M., Hartig, G., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Kimble, R.A., Krist, J., Lesser, M., Magee, D., Martel, A., McCann, Wm.J., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sirianni, M., Sparks, W., Tran, H., Tsvetanov, Z.I., White, R. 2002, **The ACS Early Release Observations**, BAAS, 200, 2401. Abstract
- Ford, H.C., Tran, H.D., Sirianni, M., Illingworth, G.D., Magee, D., Barnes, J., Clampin, M., Hartig, G., Ardila, D., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R.A., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sparks, W.B., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2002, **ACS and Keck Observations of the Dwarf Galaxy that is Interacting with UGC 10214 ("The Tadpole")**, AAS, 201, 2604. Abstract
- Gronwall, C., Pasquali, A., Pirzkal, N., Walsh, J.R., Tsvetanov, Z.I., Martel, A.R., Hook, R.N., Freudling, W., Albrecht, R., Fosbury, R.A.E., Hartig, G., Bohlin, R.C., Tran, H.D., Benítez, N. 2002, **Early Observations with the ACS Grism**, AAS, 200, 6204. Abstract
- Illingworth, G., Ford, H., Clampin, M., Hartig, G., Bartko, F., Benítez, N., Blakeslee, J., Bouwens, R., Broadhurst, T., Brown, R., Burrows, C., Cheng, E., Feldman, P., Franx, M., Golimowski, D., Gronwall, C., Kimble, R., Krist, J., Lesser, M., Magee, D., Martel, A., Meurer, G., Miley, G., Postman, M., Rosati, P., Sirianni, M., Sparks, W., Tran, H., Tsvetanov, Z., White, R. 2002, **HST ACS Early Science Results**, in Future EUV and UV Visible Space Astrophysics Missions and Instrumentation, eds. J. C. Blades & O.H. Siegmund, Proc. SPIE, Vol. 4854, in press [4854-24]. Abstract

Illingworth, G.D., Ford, H.C., Franx, M., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Gronwall, C., Martel, A., Miley, G., Postman, M., Rosati, P., Tsvetanov, Z.I. 2002, **HST Advanced Camera Observations of the Hubble Deep Fields**, BAAS, 200, 2402. Abstract

Krist, J., Golimowski, D., Hartig, G., Clampin, M., Ford, H. 2002, **The Advanced Camera for Surveys Coronagraph on the Hubble Space Telescope**, in Future EUV and UV Visible Space Astrophysics Missions and Instrumentation, eds. J. C. Blades & O.H. Siegmund, Proc. SPIE, Vol. 4854, in press, [4860-03]. Abstract | Document (12 pages, pdf, 1.7MB)

Krist, J.E., Clampin, M., Golimowski, D.A., Ardila, D.R., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R., Burrows, C.J., Cheng, E., Cross, N., Feldman, P.D., Ford, H.C., Franx, M., Gronwall, C., Hartig, G., Illingworth, G.D., Infante, L., Kimble, R.A., Lesser, M., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G., Postman, M., Rosati, R., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z., White, R.L. and Zheng, W. 2002, **HST/ACS Images of the GG Tauri Circumbinary Disk**, BAAS, 34, 1319. Abstract

Magee, D., Bouwens, R., Illingworth, G., Ford, H., Benítez, N., Blakeslee, J., Cross, N., Gronwall, C., Tsvetanov, Z., Clampin, M., Hartig, G., and the ACS Science Team, 2002, **SN2002dc**, IAU Circ. 7908, 25 May 2002. Abstract

Martel, A.R., Ford, H.C., Krist, J.E., Tran, H.D., White, R.L., Hartig, G.F., Illingworth, G.D., Clampin, M., Sparks, W.B., Tsvetanov, Z.I., Miley, G., Cross, N., Ardila, D., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R.A., Burrows, C., Cheng, E., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Infante, L., Kimble, R.A., Lesser, M., Menanteau, F., Meurer, G.R., Postman, M., Rosati, P., Sirianni, M., Zheng, W. 2002, **Coronagraphic Observations of the QSO 3C 273 with the Advanced Camera for Surveys**, AAS, 201, 11409. Abstract

Menanteau, F., Ford, H.C., Clampin, M., Illingworth, G.D., Hartig, G.F., Ardila, D., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R.A., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M., Martel, A.R., Menanteau, F., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., Tsvetanov, Z.I., White, R.L., and Zheng, W. 2002, **Internal Color Properties of Early-type Galaxies on HST/ACS ERO UCG10214**, BAAS, 34, 1277. Abstract

Meurer, G.R., Tsvetanov, Z.I., Gronwall, C., Benítez, N., Franx, M., Blakeslee, J.P., Cross, N., Ford, H., Martel, A.R., Tran, H.D., Illingworth, G.D., Clampin, M., Postman, M., Allen, T., Anderson, K., Ardila, D., Feldman, P.D., Golimowski, D.A., McCann, W.J., Menanteau, F., Sirianni, M., Zheng, W., Brown, R., Burrows, C., Hartig, G., Krist, J.E., Sparks, W.B., White, R.L., Cheng, E., Kimble, R.A., Campbell, D., Sullivan, P., Bouwens, R., Magee, D., Bartko, F., Broadhurst, T.J., Infante, L., Lesser, M., Miley, G., Rosati, P., Volmer, P., Rafal, M., and Woodruff, R.A. 2002, **ACS Grism Spectra in the HDF-North**, BAAS, 34, 1168. Abstract

Overzier, R. A., Miley, G.K., Tsvetanov, Z.I., Ardila, D.R., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R., Burrows, C., Cheng, E., Clampin, M., Cross, N., Feldman, P.D., Ford, H.C., Franx, M., Golimowski, D.A., Gronwall, C., Hartig, G.F., Illingworth, G.D., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M., Martel, A.R.,

Menanteua, F., Meurer, G.R., Postman, M., Rosati, P., Sirianni, M., Sparks, W.B., Tran, H.D., White, R.L., Zheng, W. and the ACS Science Team 2002, **ACS imaging observations of a protocluster around the $z=4.1$ radio galaxy TN1338-1942**, BAAS, 34, 1169. Abstract

Postman, M., Ford, H., Illingworth, G., Franx, M., Rosati, P., Benítez, N., Broadhurst, T., Blakeslee, J., Gronwall, C., Tsvetanov, Z., Meurer, G., Miley, G., and Bouwens, R. 2002, **The ACS Cluster Survey**, AAS, 200, 4108. Abstract

Postman, M., Rosati, P., Ford, H., Blakeslee, J.P., Illingworth, G., Franx, M., and the ACS Science Team 2002, **ACS Observations of a Rich Cluster of Galaxies at $z = 1.23$** , BAAS, 34, 1209. Abstract

Tran, H.D., Ford, H.C., Illingworth, G.D., Benítez, N., Blakeslee, J.P., Martel, A.R., Meurer, G.R., Sirianni, M., Tsvetanov, Z.I. 2002, **ACS Observations of Star Clusters in Merging Galaxies**, AAS, 200, 4308. Abstract

Tran, H.D., Sirianni, M., Ford, H.C., Illingworth, G.D., Clampin, M., Hartig, G., Becker, R.H., White, R.L., Bartko, F., Benítez, N., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Franx, M., Golimowski, D.A., Gronwall, C., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M., Magee, D., Martel, A., McCann, W.J., Meurer, G.R., Miley, G., Postman, M., Rosati, P., Sparks, W.B., Tsvetanov, Z. 2002, **ACS and Keck Observations of Young Star Clusters in the Interacting Galaxy UGC 10214**, BAAS, 34, 1238. Abstract

Tsvetanov, Z., Blakeslee, J., Ford, H., Magee, D., Illingworth, Riess, A. and the ACS Science Team, 2002, **SN2002dd**, IAU Circ. 7912, 29 May 2002. Abstract

Tsvetanov, Z., Hartig, G., Bohlin, R., Tran, H., Martel, A., Sirianni, M. 2002, **Early Observations with the ACS Ramp Filters**, AAS, 200, 6206. Abstract

Tsvetanov, Z.I., Meurer, G.R., Benítez, N., Rosati, P., Gronwall, C., Postman, M., Ardila, D.R., Blakeslee, J.P., Bouwens, R., Broadhurst, T.J., Brown, R., Burrows, C., Cheng, E., Cross, N., Feldman, P.D., Ford, H.C., Franx, M., Golimowski, D.A., Hartig, G.F., Illingworth, G.D., Infante, L., Kimble, R.A., Krist, J.E., Lesser, M., Martel, A., Menanteua, F., Miley, G., Sirianni, M., Sparks, W.B. Tran, H., White, R.L, and Zheng, W. 2002, **ACS Grism Observations of Galaxy Clusters Abell 1689 and CL1252-2927**, BAAS, 34, 1168. Abstract

[/science/papers/?for_printing=1](#)

Last updated 30 November 2004 17:36:43

Copyright © 2004 The Johns Hopkins University. All rights reserved.